Fishery Data Series No. 10-08

Goodnews River Salmon Monitoring and Assessment, 2008

Annual Report for Project FIS 07-305
USFWS Office of Subsistence Management
Fisheries Resource Monitoring Program

by

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and

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Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye to fork	MEF
mideye to tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

The Goodnews River is the primary salmon spawning drainage in the Goodnews Bay area and supports subsistence, commercial, and sport fisheries near the communities of Goodnews Bay and Platinum in Southwest Alaska. The Alaska Department of Fish and Game, in cooperation with the U.S. Fish and Wildlife Service, operates a resistance board weir to enumerate fish returning to the Middle Fork Goodnews River. In 2008, a total of 2,161 Chinook salmon *Oncorhynchus tshawytscha*, 50,459 sockeye salmon *O. nerka*, 35,350 chum salmon *O. keta*, 9,807 pink salmon *O. gorbuscha*, 36,630 coho salmon *O. kisutch*, and 1,416 Dolly Varden *Salvelinus malma* were estimated to have passed through the weir from 2 July through 15 September. Escapements for sockeye, chum, and coho salmon were above average; however, Chinook salmon escapement was below average. Chinook and sockeye salmon biological escapement goals, and chum and coho salmon sustainable escapement goals were either met or exceeded in 2008. A live trap was used to collect samples from Chinook, sockeye, chum, and coho salmon to estimate the age, sex, and length composition for each population. The Chinook salmon run was comprised of 53.3% males and dominated by age-1.3 (42.9%) fish. The sockeye salmon run was comprised of 44.3% male and dominated by age-1.3 (78.5%) fish. The chum salmon run was comprised of 38.5% male and dominated by age-0.4 (49.1%) fish. The coho salmon run was comprised of 47.1% male and dominated by age-2.1 (85.5%) fish. Aerial surveys in the Goodnews River drainage were completed in 2008 and total drainagewide run abundance was estimated using aerial survey proportions between Middle Fork and North Fork aerial survey estimates that resulted in total drainagewide escapement estimates of 4,802 Chinook salmon and 168,142 sockeye salmon, with estimated exploitation rates of 31.2% for Chinook salmon and 14.3% for sockeye salmon.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *O. keta*, coho salmon *O. kisutch*, pink salmon, *O. gorbuscha,* sockeye salmon, *O. nerka* Dolly Varden *Salvelinus malma,* escapement monitoring, Goodnews River, Kuskokwim Area, Kuskokwim Bay

INTRODUCTION

Salmon (*Oncorhynchus* spp.) returning to the Goodnews River support subsistence, commercial, and sport fisheries each summer near the community of Goodnews Bay in Southwest Alaska. The Alaska Department of Fish and Game (ADF&G), in cooperation with the U.S. Fish and Wildlife Service (USFWS), operates a resistance board weir to enumerate returning adult salmon, by species, on the Middle Fork Goodnews River (Middle Fork) in an effort to manage the resource and ensure future sustainability.

The Goodnews River watershed drains an area of nearly 1,000 mi^2 (2,589.9 km^2) along the west side of the Togiak National Wildlife Refuge (Figure 1). It flows a distance of 60 river miles (96.6 river kilometers) along its main stem, from the Ahklun Mountains southwest into Goodnews Bay. Two major tributaries, the Middle Fork and South Fork Goodnews rivers, join the mainstem a few miles from its mouth and are included within its drainage. In order to differentiate between them, the Goodnews River refers to all 3 drainages, and the mainstem Goodnews River upstream of its confluence with the Middle Fork will be referred to as the North Fork Goodnews River or North Fork.

SALMON FISHERIES

The Goodnews River is the primary salmon spawning drainage in the area and provides a vital subsistence fishery resource for residents from the communities of Goodnews Bay and Platinum. Subsistence fishing is allowed throughout the Goodnews River drainage and in Goodnews Bay, which is primarily performed with drift and set gillnets. ADF&G has quantified subsistence salmon harvests in the communities of Goodnews Bay and Platinum since 1977. Harvest estimates are determined from interviews with subsistence fishermen in October and November (Whitmore et al. 2008). Sockeye salmon *O. nerka* are the most utilized subsistence salmon

species in the Goodnews Bay area over the past 10 years followed by Chinook *O. tshawytscha*, coho *O. kisutch*, and chum *O. keta* (Appendix A1).

Commercial salmon fishing occurs in Goodnews Bay within the boundaries of District W-5 (Figure 2). Commercial fishing has occurred annually in District W-5 since it was established by the Alaska Board of Fisheries (BOF) in 1968. This is the southernmost district in the Kuskokwim Area, which includes districts in Kuskokwim Bay and the Kuskokwim River. Permit holders have unrestricted movement between commercial fishing districts within the Kuskokwim Area and fishermen from distant communities often participate in the District W-5 commercial fishery. In 2004, the BOF moved the District W-5 western boundary from a line between the northernmost tip of the north spit and the southernmost tip of the south spit to a line between regulatory markers placed outside Goodnews Bay, approximately 2 miles along the edge of the north and south spit.

The commercial fishery is primarily directed toward harvesting sockeye and coho salmon and is conducted from skiffs using hand-pulled gillnets. Pink salmon *O. gorbuscha* are the least valuable species commercially and have not been targeted in recent years. ADF&G has collected harvest data from fish buyers and processors since the district was created.

Sport fishing occurs throughout the Goodnews River drainage. Pacific salmon, rainbow trout *O. mykiss*, Dolly Varden *Salvelinus malma*, Arctic char *S. alpinus*, and Arctic grayling *Thymallus arcticus* are targeted. Many sport fishers take commercially guided or unguided float trips from lakes in the headwaters to the mouth at Goodnews Bay. There is currently one commercially operated lodge with a semi-permanent camp in the drainage that offers fishing from powered skiffs. ADF&G has been estimating sport fish harvests consistently since 1991.

PROJECT HISTORY

ADF&G, Division of Commercial Fisheries, has operated a salmon escapement monitoring project on the Middle Fork Goodnews River since 1981 (Appendix B1). The project was initiated as a counting tower in 1981 and operated through 1990 (Burkey 1989, 1990; Schultz 1982, 1984a, b, 1985, 1987; Schultz and Burkey 1989) targeting counts of Chinook, sockeye, and chum salmon. Although successful, the tower was limited by problems with species apportionment and high labor costs (Menard 1999). In 1991, resources were redirected towards a fixed-picket weir to reduce labor costs and improve species identification. The fixed-picket weir was operated from 1991 through mid-season 1997, approximately 250 yd (229 m) downstream from the former tower site. Fish passage could be controlled, eliminating the need for hourly monitoring and increasing the efficiency of collecting age, sex and length (ASL) information. Personnel were reduced from 3 crew members to 2. Flood events were problematic if the weir could not be removed early in the season. The weir would rapidly collect debris, damming the flow until it failed and washed downstream, which occurred several times during the early 1990s.

In the mid 1990s, ADF&G began cooperating with the USFWS Togiak National Wildlife Refuge to build a resistance board weir and extend the project's operational period to include coho salmon run in August and September. In July 1997, the fixed-picket weir was replaced with a resistance board weir, which is designed to shed debris loads by sinking under high water conditions and has allowed the project to remain operational at higher water levels compared to the fixed-picket weir. The resistance board weir design can be rendered inoperable during extreme high water events; however, the design can remain operational at higher water levels and can regain operations quickly once high water events subside.

Extended operation of the weir has also allowed biologists to monitor the migration of smaller Dolly Varden, believed to be a pre-spawning population overwintering in the drainage (Lisac 2003). Dolly Varden contributes to the overall subsistence harvest of the residents of the Goodnews Bay area (Wolfe et al. 1984). However, information about their life history and abundance is limited.

ESCAPEMENT MONITORING AND ESCAPEMENT GOALS

The Middle Fork Goodnews River weir serves primarily as a management tool for the commercial and subsistence salmon fisheries in the Goodnews Bay area, but also generates data relevant to the Goodnews River drainage as a whole. These data are used to make inseason management decisions, to estimate drainage-wide escapement, and to develop both sustainable escapement goals (SEG) and biological escapement goals (BEG). The project also serves as a platform for other studies in the drainage, such as collecting samples for genetic stock identification and tagging Dolly Varden to study run timing and seasonal distribution (Lisac 2008, *In prep*).

Salmon escapement objectives for the Middle Fork counting tower were initially established in 1984 as ranges set at 3,000–4,000 Chinook, 35,000–45,000 sockeye, and 13,000–18,000 chum salmon (Schultz 1984b). An escapement objective was not established for coho salmon as the project typically ceased operation in mid August, which is well before the coho run ends. In 1989, the escapement objective range for sockeye salmon was reduced to 20,000–30,000 fish. An evaluation of the sockeye salmon exploitation rate in previous years indicated that historical harvest levels could be maintained with a reduced escapement objective (Burkey 1990). These ranges remained in place when the tower was replaced with the fixed-picket weir in 1991.

In 1992, weir based SEGs were first established for Chinook, sockeye, and chum salmon (Buklis 1993). The respective SEGs were set as the midpoints of tower escapement objective ranges: 3,500 Chinook, 25,000 sockeye, and 15,000 chum salmon. In 2004, evaluation of Arctic-Yukon-Kuskokwim (AYK) Region escapement goals resulted in establishment of revised SEGs for the Middle Fork Goodnews River weir (ADF&G 2004). The revised goals, described as ranges or thresholds, were 2,000–4,500 Chinook salmon, 23,000–58,000 sockeye salmon, and greater than 12,000 chum salmon. An SEG threshold was also established for coho salmon at greater than 12,000. In 2007, evaluation of AYK Region escapement goals resulted in a revision of the Middle Fork Goodnews River weir Chinook and sockeye salmon escapement goals from SEGs to BEGs (Brannian et al. 2006). Ricker two parameter spawner-recruit models were used to estimate the escapement that produces maximum sustained yield (MSY) (Tables 1 and 2; Molyneaux and Brannian 2006). The current BEG for Chinook salmon is set at 1,500–2,900 fish and the current BEG for sockeye salmon is set at 18,000–40,000 fish.

Goodnews River drainage salmon escapements have also been monitored by aerial survey since 1962 (Appendix C1). Aerial survey escapement assessment can be subject to variability depending on conditions and observers; however, when observers, timing, and methods are standardized, to the extent feasible and survey conditions meet acceptable criteria, the resulting counts represent an index of escapement. Procedures established in recent years have increased the annual consistency of Goodnews River aerial surveys through the creation of an aerial survey location database, intensive preflight planning, and establishment of dedicated aerial survey staff. Additionally, variability between observers and methods has been addressed through standardized training and consistency in observers, pilots, and aircraft used.

Aerial surveys are directed at indexing spawning populations of Chinook and sockeye salmon. Chum salmon have protracted run timing requiring multiple surveys throughout their run to ensure an adequate index of escapement and have been discontinued until survey methods can be improved or funding can be secured to allow for multiple aerial surveys. Additionally, Goodnews River coho salmon have been difficult to survey because of recurrent poor weather conditions. Coho salmon aerial surveys have been conducted when funding and weather conditions allow.

North Fork Goodnews River aerial survey escapement goals of 1,600 Chinook, 15,000 sockeye, 17,000 chum, and 15,000 coho salmon were initially established in 1992 (Buklis 1993). Middle Fork Goodnews River aerial survey escapement goals were established in 1992 at 800 Chinook, 5,000 sockeye, 4,000 chum, and 2,000 coho salmon. In 2004, evaluation of AYK Region escapement goals resulted in establishment of revised SEGs for Goodnews River aerial surveys (ADF&G 2004). The revised SEGs represent ranges, or thresholds, and were set at 640–3,300 Chinook and 5,500–19,500 sockeye salmon on the North Fork Goodnews River only. The North Fork chum and coho salmon aerial survey escapement goals set in 1992 were discontinued because of poor data quality. The aerial survey escapement goals set for the Middle Fork Goodnews River in 1992 were discontinued in deference to the revised SEGs set for the Middle Fork Goodnews River weir in 2004.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Salmon ASL information has been collected from the weir project since 1984 and from District W-5 commercial harvest since 1985. Annual ASL composition estimates of escapement are used to develop stock-recruitment models, in turn providing information used for projecting future run sizes. Historical summaries of existing ASL information for salmon returning to the Goodnews River drainage can be found in Molyneaux and Folletti (2007).

SITE DESCRIPTION

The Middle Fork parallels the North Fork and flows a distance of approximately 45 river miles (72.4 river kilometers) before joining the main stem. The weir project is located approximately 10 river miles (16.1 river kilometers) from the village of Goodnews Bay on the Middle Fork at latitude 59° 09.595’ N, longitude 161° 23.287’ W (Figure 1). The channel at the weir location is approximately 200 ft (61.0 m) wide, has a regular profile from 1 to 4 ft deep, which tapers to low cut banks on either side and flows 2 to 4 ft per second during average water conditions. The river substrate is primarily cobblestone, gravel, and sand. The upstream half of the channel is characterized by deep water along a steep cut bank approximately 20 ft (6.1 m) in height on the left bank (as looking downstream) tapering to a gravel bar on the right bank. The project camp site is located on the left bank approximately 50 yd (45.7 m) upstream and 30 yd (27.4 m) inland from the weir location. Weir materials are stored over the winter on the left and right banks, approximately 30 yd (27.4 m) inland and parallel to the weir location.

OBJECTIVES

The annual objectives for the Middle Fork Goodnews River weir project are to:

1. Estimate Chinook, sockeye, chum, and coho salmon escapement in Middle Fork Goodnews River.

2. Estimate run timing of Chinook, sockeye, chum, and coho salmon and Dolly Varden to the Middle Fork Goodnews River.
3. Estimate escapement of Chinook, sockeye, chum, and coho salmon to Goodnews River drainage.
4. Estimate Chinook, sockeye, chum, and coho salmon ASL composition of Middle Fork Goodnews River escapement.
5. Estimate Dolly Varden passage at the Middle Fork Goodnews River weir.
6. Serve as a platform to collect genetic samples of salmon stocks at the Middle Fork Goodnews weir.
7. Serve as a platform for tagging Dolly Varden at the Middle Fork Goodnews weir.
8. Record atmospheric and hydrologic conditions at the weir site.

METHODS

RESISTANCE BOARD WEIR

Methods for the design, construction, and installation of the resistance board weir followed Stewart (2002, 2003) and Tobin (1994). The approximately 200 ft (60.9 m) weir used at the Middle Fork Goodnews River site is comprised of two principle components: the substrate rail and the resistance board panel sections. Picket spacing of the weir panels allowed for a complete census of all but the smallest returning Chinook, sockeye, chum, and coho salmon. The picket interval of the Middle Fork Goodnews River weir is 2.6 inches, which leaves a gap of 1.3 inches between pickets. The picket spacing allowed smaller fish, such as pink salmon and other non salmon species, to pass upstream and downstream through the weir. New weir panels were constructed in May 2008 to replace existing panels, following construction procedures outlined in Stewart (2002). Federal project funds were used to purchase the materials and equipment necessary to construct the panels and transport weir panel materials to the project site. Further details of resistance board weir components used for the Goodnews River weir are described in Stewart (2004).

Two fish passage chutes were installed on the weir, one approximately 50 ft (15.2 m) from the left bank (as looking downstream), the other approximately 15 ft (4.57 m) from the left bank. A 10 ft (3 m) by 15 ft (4.6 m) live trap used to collect fish for ASL sampling was installed directly upstream of the passage chute located farthest from the left bank. The near shore fish passage chute was connected to a passage gate that incorporates an underwater video camera that recorded fish passage. Gates were attached on both chutes to control fish passage.

Boats passed at a designated boat gate located near the center of the weir and boat operators were able to pass with little or no involvement by the weir crew. The boat gate consisted of boat passage panels described in Estensen and Diesigner (2004). Weight of a passing boat temporarily submerged the boat gate panels, allowing boats to pass over the weir. Boats with jet-drive engines were common and could pass upstream and downstream over the boat gate easily at reduced speed. Rafts could pass downstream by submerging the boat passage panels and drifting over the weir. Boats with propeller-drive engines were uncommon and require being towed upstream across the weir with the assistance of crew members.

AERIAL SURVEYS

Aerial surveys were flown during peak spawning periods for each species in order to maximize the number of observable fish on the spawning grounds. Peak spawning periods were developed from run timing estimates and vary by species. Aerial surveys were numerically ranked on a scale of 1 = good, 2 = fair, and 3 = poor. Ranking criteria were based on survey method, weather and water conditions, time of survey, and spawning stage. Only surveys with rankings of fair and good (1 and 2) that were conducted within the peak spawning period are included as part of the Goodnews River aerial survey database.

Chinook salmon aerial surveys were focused on the main river channel and larger tributaries while sockeye salmon aerial surveys were focused on the main river channel, larger tributaries and lakes, and larger lake tributaries. Aerial survey counts were tallied to derive a total count of observable fish in the North Fork and Middle Fork of the Goodnews River.

ESCAPEMENT MONITORING AND ESTIMATES

The target operational period for the Middle Fork Goodnews River weir in 2008 was 26 June through 15 September. To determine salmon escapement past the weir, fish passage counts were made daily during the operational period of the project. Passage counts occurred regularly throughout the day, typically for 1–2 hour periods, beginning in the morning and continuing as late as light permitted. During counting periods the passage gate was opened to allow fish to pass through the weir. Counts were also conducted using underwater video equipment. The video allowed for continuous fish passage during periods with adequate lighting. Crew members were able to simultaneously address other duties while allowing fish moving through the video gate unrestricted. All fish passage captured by the video equipment was reviewed by the crew and included in escapement estimates. Crew members identified and enumerated all fish by species. Any fish observed traveling downstream through the fish passage gates were subtracted from the tally; however, salmon passing downstream prior to spawning is a rare event.

For various reasons, fish sometimes migrated downstream and required safe passage over the weir. This behavior was common among rainbow trout, Dolly Varden, and whitefish species *Coregonus* spp. The resistance board weir provided a means of accommodating downstream fish passage through incorporation of downstream passage chutes. Each chute consisted of a single panel set to allow some water to flow over the distal end of the panel. Further details of downstream passage chutes are described by Linderman et al. (2002). Fish do not typically pass upstream over these chutes and they are only set during periods of active downstream fish migration and were not enumerated. Downstream passage chutes were not used during periods of strong upstream salmon passage.

Salmon escapements were estimated for periods when a breach occurred in the weir. Estimates were assumed to be zero if passage was considered negligible based on historical data and run timing indicators. Breach event estimates were calculated as the average observed passage 2 days before and after the day a breach occurred using the following formula:

$$n_d = \left(\frac{\left(n_{d-2} + n_{d-1} + n_{d+1} + n_{d+2} \right)}{4} \right) - p \qquad (1)$$

where:

n_d = number of salmon passing through weir breach on day being estimated,

n_{d-2}, n_{d-1} = observed passage from 2 days before the day a weir breach occurred,

n_{d+1}, n_{d+2} = observed passage from 2 days after the day a weir breach occurred, and

p = passage observed on the given day being estimated.

Daily estimated salmon passage then became the sum of any observed passage from the day the weir breach occurred and the breach estimate.

When the weir was not operational for two or more days and later became operational, passage estimates for the inoperable days were calculated using the following formula:

$$\hat{n}_d = (\alpha + \beta \cdot i) - p \tag{2}$$

$$\alpha = \frac{n_{d-1} + n_{d-2}}{2}$$

$$\beta = \frac{\left(n_{d+I} + n_{d+I+1}\right) - \left(n_{d-2}, n_{d-1}\right)}{2\left(I + 1\right)}$$

where

I = number of inoperative days ($I > 2$), and

$n_{d+I,} n_{d+I+1}$ = observed passage the first day after the weir was reinstalled.

Weir escapement was also estimated for periods when the weir was not operational but within the targeted operational dates. Estimates were calculated based on the proportional relationship between observed weir counts at the Middle Fork Goodnews River weir and weir counts from a model data set. The model data set could be from a different year at Goodnews River or from the same year at a neighboring weir project. The model data set was selected based on the strongest (Pearson) correlation between observed passage during the operational period at Middle Fork Goodnews River weir and observed passage from a model data set during the same time period. Daily passage estimates were the result of daily passage proportions of the model data set relative to the observed weir counts minus any observed passage from the day being estimated, and were calculated using the following formula:

$$\breve{n}_d = \left(\frac{\left(n_{d_c} \times \left(\sum_{d_z}^{d_a} y_e\right)\right)}{\left(\sum_{d_z}^{d_a} y_c\right)} \right) - n_{d_e} \tag{3}$$

where:

$\breve{n}_d$ = passage estimate for the day weir was not operational,

n_{d_c} = the number of fish per species that passed the weir on that day from the model data set,

$\sum_{d_z}^{d_a} y_e$ = the sum of all daily counts per species for the year being estimated,

$\sum_{d_z}^{d_a} y_c$ = the corresponding sum of all daily counts per species from the model data set,

n_{d_e} = the number of observed fish per species that passed the weir on that day for the year being estimated.

Chinook and sockeye salmon Goodnews River drainage escapement was estimated by, applying the proportion of fish observed between the Middle Fork and North Fork aerial surveys to the weir escapement. Drainage escapement estimates account for the number of fish counted past the weir after aerial surveys were conducted and were calculated using the following formula:

$$N_d = \left(\left[\frac{n_{a_{nf}}}{n_{a_{mf}}} \right] n_{w_2} \right) + n_{w_2} \quad (4)$$

where:

N_d = total drainage escapement estimate,

$n_{a_{nf}}$ = aerial survey count from the North Fork Goodnews River,

$n_{a_{mf}}$ = aerial survey count from the Middle Fork Goodnews River,

n_{w_2} = final weir escapement count including any estimates.

AGE, SEX, AND LENGTH ESCAPEMENT SAMPLING

Escapement sampling for Chinook, sockeye, chum, and coho salmon ASL composition estimates were conducted based on the pulse sampling design of Molyneaux and Folletti (2007). Each pulse consisted of intensive sampling for 1 to 3 day intervals followed by a few days without sampling. The goal for each pulse was to collect samples from 210 Chinook, 210 sockeye, 200 chum, and 170 coho salmon. These sample sizes were selected for simultaneous 95% confidence interval estimates of age composition ± 0.1 and were adjusted from sample sizes recommended by Bromaghin (1993) to account for regenerated and otherwise unreadable scales. The minimum number of pulse samples was one per species from each third of the run.

Salmon were sampled from a fish trap installed in the weir. The general practice was to open the entrance gate and leave the exit gate closed allowing fish to accumulate inside the holding pen. The holding pen was typically allowed to fill with fish and sampling was done during scheduled counting periods.

Scales were removed from the preferred area of the fish (INPFC 1963). Sex was determined by visually examining external morphology, keying on the development of the kype, roundness of the belly, and the presence or absence of an ovipositor. Length was measured to the nearest millimeter from mideye to tail fork. After sampling was completed, relevant information such as sex, length, date, and location was copied from hardcopy forms to computer mark–sense forms. The completed gum cards and data forms were sent to the Bethel and Anchorage ADF&G

offices for processing. Further details of sampling procedures can be found in Molyneaux and Folletti (2007) and Stewart (2004).

AGE, SEX, AND LENGTH COMMERCIAL HARVEST SAMPLING

Commercial catch sampling for Chinook, sockeye, chum, and coho salmon ASL composition estimates was intended to follow the pulse sampling design of Molyneaux and Folletti (2007). Each pulse sample was to be taken from a single commercial period, which was determined based on the number of commercial periods that occurred in a given week. The primary goal was to characterize the ASL composition of the entire commercial harvest for each species. The goal for each pulse was to collect samples from 210 Chinook, 210 sockeye, 200 chum, and 170 coho salmon; however, due to logistic problems encountered in 2008, no commercial ASL data was collected from the W-5 commercial fishery.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

ADF&G staff in Bethel and Anchorage aged scales, processed the ASL data, and generated data summaries (Molyneaux and Folletti 2007). These procedures generated two types of summary tables for each species; one described the age and sex composition and the other described length statistics. These summaries account for ASL composition changes over the season by first partitioning the season into temporal strata based on pulse sample dates, applying age and sex composition of individual pulse samples to the corresponding temporal strata, and finally summing the strata to generate the estimated age and sex composition for the season. This procedure ensured ASL composition estimates were weighted by fish abundance in the escapement or harvest rather than fish abundance in the samples. Likewise, estimated mean length composition was calculated by weighting sample mean lengths from each stratum by the escapement or harvest of salmon during that stratum. Similar procedures were used for coho salmon; however, sample design modifications implemented in 2004 and 2005 reduced the ability to estimate changes in ASL composition through the season in favor of estimating ASL composition for the entire run or harvest.

Ages were reported in tables using European notation. European notation is composed of two numerals separated by a decimal, where the first numeral indicates the number of winters spent by the juvenile fish in fresh water and the second numeral indicates the number of winters spent in the ocean (Groot and Margolis 1991). Total age is equal to the sum of these two numerals plus one to account for the single winter of egg incubation in the gravel. For example, a Chinook salmon described as an age 1.4 fish under European notation has a total age of 6 years.

The original ASL gum cards, acetates, and mark–sense forms were archived at the ADF&G office in Anchorage. The computer files were archived by ADF&G in the Anchorage and Bethel offices.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological conditions were recorded around noon each day. Cloud cover was judged in percent covered; wind speed was estimated in miles per hour and direction was noted; precipitation was measured in mm per 24 hours. Daily high and low air and water temperatures were recorded in degrees Celsius. The river gauge height was recorded daily and was pegged to a benchmark established in 1997 representing a river stage of 150 cm. The benchmark is a 0.75 in diameter steel length of rebar driven into the bank along a steep grade downstream of the field

camp. The river gauge is a steel rule installed near shore in the river and is set level with the top of the benchmark at 150 cm.

RESULTS

SALMON FISHERIES

Subsistence, commercial, and sport fishing activities occurred in District W-5, Goodnews Bay, and within the Goodnews River drainage in 2008. At the time of publication, 2008 subsistence harvest estimates for the communities of Goodnews Bay and Platinum were not final though discussions with participants' inseason indicated subsistence needs were met. Sport fish harvest estimates for Goodnews River in 2008 were not available for this report.

PROJECT OPERATIONS

The target operational period of 26 June through 15 September was not achieved in 2008 as the weir was only operational from 2 July through 15 September. Weir operations were delayed from 26 June through 1 July due to high water preventing installation of the weir. Holes in the weir caused by damage were discovered on 16, 17, 18, 22 July, and 3 August. Water levels remained at a workable level through the end of the season. The weir crew began weir disassembly and camp closure on 15 September.

WEIR ESCAPEMENT

The 2008 Middle Fork Goodnews River Chinook salmon escapement was estimated to be 2,161 fish during the target operational period. A total of 1,994 Chinook salmon were observed passing upstream through the weir and 167 fish (≈8%) were estimated to have passed upstream during breach events and inoperable periods (Table 3). Chinook salmon escapement was within the SEG range of 1,500–2,900 fish (Table 4). The first Chinook salmon was observed on 2 July, the first day of operation, and the last Chinook salmon was observed on 5 September. Based on the target operational period and inclusive of estimated passage, the median passage date was 22 July and the central 50% of the run occurred between 14 July and 28 July (Table 5).

The 2008 Middle Fork Goodnews River sockeye salmon escapement was estimated to be 50,459 fish during the target operational period. A total of 35,688 sockeye salmon were observed passing upstream through the weir and 14,771 fish (≈29%) were estimated to have passed upstream during breach events and inoperable periods (Table 3). Sockeye salmon escapement exceeded the upper end of the SEG range of 18,000–40,000 fish (Table 4). The first sockeye salmon was observed on 2 July, the first day of operation, and the last sockeye salmon was observed on 15 September, the last day of operation. Based on the target operational period and inclusive of estimated passage, the median passage date was 8 July and the central 50% of the run occurred between 3 July and 15 July (Table 5).

The 2008 Middle Fork Goodnews River chum salmon escapement was estimated to be 44,699 fish during the target operational period. A total of 35,350 chum salmon were observed passing upstream through the weir and 9,349 fish (≈21%) were estimated to have passed upstream during breach events and inoperable periods (Table 3). Chum salmon escapement exceeded the SEG threshold of 12,000 fish (Table 4). The first chum salmon was observed on 2 July, the first day of operation, and the last chum salmon was observed on 15 September, the last day of operation.

Based on the target operational period and inclusive of estimated passage, the median passage date was 23 July and the central 50% of the run occurred between 13 July and 31 July (Table 5).

The 2008 Middle Fork Goodnews River coho salmon escapement was estimated to be 36,630 fish. A total of 33,099 coho salmon were observed passing upstream through the weir and 3,531 fish (≈10%) were estimated to have passed upstream during breach events and inoperable periods (Table 3). Coho salmon escapement exceeded the SEG threshold of 12,000 fish (Table 4). The first coho salmon was observed on 23 July and the last coho salmon was observed on 15 September the last day of operation. Based on the target operational period and inclusive of estimated passage, the median passage date was 4 September and the central 50% of the run occurred between 30 August and 11 September (Table 5).

The 2008 Middle Fork Goodnews River total pink salmon count was 9,807 fish (Table 6). No estimate of missed escapement is made for pink salmon because spacing between the weir pickets allows all but the largest pink salmon to pass through the weir unobserved. The first pink salmon was observed on 2 July, the first day of operation, and the last pink salmon was observed on 15 September, the last day of operation.

The 2008 Middle Fork Goodnews River total count of Dolly Varden was 1,416 fish (Table 6). Similar to pink salmon, no estimates of missed passage were made for Dolly Varden because spacing between the weir panel pickets allows smaller Dolly Varden to pass through the weir unobserved. The first Dolly Varden was observed on 2 July, the first day of operation, and the last Dolly Varden was observed on 15 September, the last day of operation. The median passage date was 23 July and the central 50% of the run occurred between 20 July and 26 July (Table 5).

No passage estimates were made for whitefish and rainbow trout in 2008 because spacing between the weir panel pickets allows smaller fish of these species to freely pass through the weir unobserved.

AERIAL SURVEYS

Aerial surveys of the Goodnews River drainage were conducted on 5 August in 2008. The North Fork and Middle Fork Goodnews River aerial survey were completed for all index areas (Figure 3). The counts for the North Fork were 2,371 Chinook salmon and 32,500 sockeye salmon and, the counts for the Middle Fork were 1,940 Chinook and 13,935 sockeye salmon.

DRAINAGE ESCAPEMENT

Goodnews River drainage-wide escapement was estimated for Chinook and sockeye salmon in 2008. North Fork Chinook salmon escapement was estimated by applying the proportion of aerial survey counts between the North Fork and the Middle Fork to weir escapement (Appendix D1). North Fork Chinook salmon escapement was estimated to be 2,641 fish and North Fork sockeye salmon escapement was estimated to be 117,683 fish (Table 4; Appendix D1 and D2). Escapement to the Goodnews River drainage was estimated to be 4,802 for Chinook salmon and 168,142 for sockeye salmon. The resulting exploitation rate was 31.2% for Chinook salmon and 14.3% for sockeye salmon (Table 4; Appendix D1 and D2).

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

Middle Fork Goodnews River Escapement

Scale samples, sex, and length data were collected from 144 Chinook salmon at the weir in 2008 (Table 7). Samples were collected from 4 pulses ranging in size from 12 to 87 fish per pulse. The number of samples did not achieve the minimum sample objectives but was adequate for estimating ASL composition of weir escapement. Age was determined for 123 of the 144 fish sampled (85.4%). Applied to aged samples, age-1.3 Chinook salmon were the most abundant age class (42.9%), followed by age-1.4 (25.2%), age-1.2 (17.6%), age-1.1 (7.3%), and age-1.5 (7.1%) fish. Sex composition applied to aged samples was 53.3% males and 46.7% females. Mean male length of the samples by age class was 363 mm for age-1.1 fish, 532 mm for age-1.2 fish, 701 mm for age-1.3 fish, 822 mm for age-1.4 fish and 975 mm for age 1.5 fish (Table 8). Mean female length of the samples by age class was 719 mm for age-1.3 fish, 837 mm for age-1.4 fish, and 913 mm for age-1.5 fish. Overall, male sample lengths ranged from 267 to 990 mm and female sample lengths ranged from 362 to 956 mm.

Scale samples, sex, and length data were collected from 894 sockeye salmon at the weir in 2008 (Table 9). Samples were collected from 3 pulses ranging in size from 96 to 514 fish per pulse. The number of samples achieved the minimum sample objectives and was adequate for estimating ASL composition of weir escapement. Age was determined for 512 of the 894 fish sampled (57.2%). Escapement was partitioned into 3 temporal strata based on sample dates. Applied to escapement, age-1.3 sockeye salmon were the most abundant age class (78.5%), followed by age-1.2 (9.2%), age-0.3 (4.4%), age-2.3 (3.4%), age-1.4 (3.3%), age-2.2 (1%), and age-0.4 (0.2%) fish. Sex composition applied to aged samples was 43.3% males and 56.7% females. Mean male length by age class was 577 mm for age-0.3 fish, 506 mm for age-1.2 fish, 584 mm for age-0.4, 568 mm for age-1.3 fish, 504 mm for age-2.2 fish, 591 mm for age-1.4 fish, and 588 mm for age-2.3 fish (Table 10). Mean female length by age class was 535 mm for age-0.3 fish, 487 mm for age-1.2 fish, 568 mm for age-0.4, 532 mm for age-1.3 fish, 468 mm for age-2.2 fish, 554 mm for age-1.4 fish, and 528 mm for age-2.3 fish. Overall, male lengths ranged from 428 to 633 mm and female lengths ranged from 420 to 652 mm.

Scale samples, sex, and length data were collected from 1,494 chum salmon at the weir in 2008 (Table 11). Samples were collected from 6 pulses ranging in size from 210 to 379 fish per pulse. The number of samples achieved the minimum sample objectives and was adequate for estimating ASL composition of weir escapement. Age was determined for 1,243 of the 1,494 fish sampled (82.7 %). Escapement was partitioned into 6 temporal strata based on sample dates. Applied to escapement, age-0.4 chum salmon was the most abundant age class (49.1%), followed by age-0.3 (44.8%), age-0.5 (5.8%) and age-0.2 (0.3%) fish. Sex composition applied to aged samples was 38.5% males and 61.5% females. Mean male length by age class was 582 mm for age-0.2 fish, 592 mm for age-0.3 fish, 608 mm for age-0.4, and 612 mm for age-0.5 fish (Table 12). Mean female length by age class was 509 mm for age-0.2 fish, 558 mm for age-0.3 fish, 571 mm for age-0.4 fish, and 577 mm for age-0.5 fish. Overall, male lengths ranged from 498 to 696 mm and female lengths ranged from 439 to 641 mm.

Scale samples, sex, and length data were collected from 795 coho salmon at the weir in 2008 (Table 13). Samples were collected from 4 pulses ranging in size from 170 to 237 fish per pulse. The number of samples achieved the minimum sample objectives and was adequate for estimating ASL composition of weir escapement. Age was determined for 579 of the 795 fish

sampled (72.8 %). Escapement was partitioned into 4 temporal strata based on sample dates. Applied to escapement, age-2.1 coho salmon was the most abundant age class (85.5%), followed by age-1.1 (9.2%), and age-3.1 (5.3%) fish. Sex composition applied to aged samples was 47.1% males and 52.9% females. Mean male length of the samples by age class was 559 mm for age-1.1 fish, 581 mm for age-2.1 fish, and 599 mm for age-3.1 fish (Table 14). Mean female length of the samples by age class was 576 mm for age-1.1 fish, 587 mm for age-2.1 fish, and 579 mm for age-3.1 fish. Overall, male sample lengths ranged from 375 to 673 mm and female sample lengths ranged from 463 to 646 mm.

District W-5 Commercial Harvest

A total of 25 permit holders fished commercially in District W-5 for total harvests of 1,281 Chinook, 27,236 sockeye, 10,340 chum, and 22,547 coho salmon (Table 15). No pink salmon were reported commercially harvested in 2008. Exvessel value by species was $13,189 for Chinook, $104,518 for sockeye, $3,839 for chum, and $77,412 for coho salmon for a total exvessel value of $198,958.

No scale samples, or sex and length data were collected from Chinook, sockeye, chum and coho salmon harvested commercially in the 2008 District W-5 fishery due to monetary cost and logistical difficulties.

ATMOSPHERIC AND HYDROLOGICAL MONITORING

Atmospheric and hydrological observations were recorded daily from 22 June through 17 September (Table 16). Air temperatures ranged from 5.5˚ to 24˚ C. Water temperature was more consistent ranging from 8˚ to 15˚ C. Several rain events resulted in daily accumulations from trace amounts up to 71 mm in a 24 h period. Water level ranged from 12 to 60 cm.

DISCUSSION

PROJECT OPERATIONS

The 2008 weir operation was successful in enumerating the passage of Chinook, sockeye, chum, and coho salmon past the weir during operational periods, as well as Dolly Varden migration. The majority of project objectives were achieved with the exception of Chinook salmon escapement ASL sampling goals and commercial harvest ASL sampling goals. The project continues to add to the long-term escapement, run timing, and ASL database for salmon returning to the Goodnews River and serves as a platform to study other anadromous and resident freshwater species.

Average water levels through July and the first half of August contributed towards uninterrupted weir operations in 2008 and did not appear to hamper fish passage. However, in late June the Goodnews River drainage experienced high water levels, which prevented installation of the weir before 2 July.

Achieving the Chinook salmon ASL sample objectives continues to be problematic. Low daily abundance, migration patterns, and behavior at the weir have made sample collection difficult. Minimum Chinook salmon sample objectives were not achieved; however, estimates were made based on the samples collected. Chinook salmon tend to migrate in large pulses so that their passage may be slow for a period of days and then suddenly peak. Coordinating ASL sampling to coincide with these pulses is difficult because timing of the pulses cannot be accurately

predicted. An active sampling strategy of capturing Chinook salmon individually or in small groups as other species are allowed to pass freely through the trap has improved sample sizes, but the fish trap used at the weir does not present the best platform for active sampling. This strategy can work well, but is time intensive and Chinook salmon are often hesitant to approach the trap in its current fixed location and when there is increased activity around the trap. In an effort to achieve Chinook salmon sample objectives, active sampling will continue to be conducted at the weir and an additional live trap was introduced in 2007 to foster increased sampling opportunity. Additionally, staff is currently evaluating revised sampling goals that would be more appropriate to the lower relative abundance of escapements seen at the Middle Fork Goodnews River weir. Analysis is ongoing and revised sampling goals are expected in the near future.

Achieving the District W-5 commercial ASL sample objectives has continued to prove problematic as well. Although the partnership between ADF&G and CVRF to collect commercial ASL samples in Quinhagak has met with overall success in achieving adequate commercial ASL sample goals from District 4, achieving sample goals for the District 5 commercial harvest remained difficult. The commercial catch is tendered from Goodnews Bay to Quinhagak and does not arrive until the day following each commercial opening and is dependent upon tidal cycles at the mouth of the Kanektok River. Although the Costal Village Region Fund (CVRF) sampling crew was based in Quinhagak, coordinating sample crew availability with tender arrival in Quinhagak remained problematic. This resulted in no salmon ASL samples being collected from the District 5 commercial fishery in 2008. Typically the catch is processed before sampling can occur. Additionally, the tender would sometimes arrive at the Quinhagak dock in the early morning hours when the sampling crew was not available. It is anticipated that these issues will be alleviated when CVRF begins operating a new fish processing plant in Platinum at the western end of Goodnews Bay in 2009.

ESCAPEMENT MONITORING AND ESTIMATES

Chinook Salmon

The 2008 Chinook salmon weir escapement of 2,161 fish (Figure 4; Appendix B1) was within the BEG range; however, the escapement was below the recent 10-year average from 1998 through 2007. Chinook salmon counts are not available for 26 June to 1 July due to the late start of weir operations. Estimates for this time period can be made using an escapement from a previous year's data set that shows a strong correlation with 2008. No previous year showed strong correlation to the 2008 run due to the overall lateness of the run. It is assumed that a negligible amount of fish passed the weir before the weir became operational, and had little influence on the overall escapement estimate. The general trend of Chinook salmon escapement in the Middle Fork Goodnews River since 1981 indicates fluctuations of abundance and a recent higher relative abundance since 1992; however, it should be noted that the later trend may be affected by the 1991 change in methodology from counting tower to weir-based escapement estimates.

Sockeye Salmon

The 2008 sockeye salmon weir escapement of 50,459 fish exceeded the upper end of the BEG range; however, escapement was below (12%) the recent 10-year average, and well below the two record escapement in 2005 and 2006 (Figure 4; Appendix B1). Due to the late start of weir

operations, sockeye salmon escapement numbers prior to the weir becoming operational on July 2 were estimated for 26 June through 2 July using data from the 2004 daily escapement data set. This data set was chosen because it showed a strong correlation with the 2008 sockeye run. The general trend of Middle Fork Goodnews River sockeye salmon escapement since 1981 indicates fluctuations of abundance and a higher relative abundance over the last four years. Similar to Chinook salmon, these trends may be affected by the 1991 change in methodology from counting tower to weir based escapement estimates.

Chum Salmon

The 2008 chum salmon weir escapement of 44,699 fish was the third highest escapement since Middle Fork Goodnews River escapement assessment projects were initiated in 1981 (Figure 4; Appendix B1) and was 46% higher than the recent 10-year average. Due to the late start of weir operations, chum salmon escapement numbers were estimated for 26 June through 2 July using correlated data from the 2002 daily escapement data set. The general trend of chum salmon escapement into the Middle Fork Goodnews River since 1981 suggest fluctuations in abundance and a higher relative abundance since 1992; however, it should be noted, again, that the 1991 change in methodology from counting tower to weir-based escapement estimates may have caused inaccuracies in chum salmon escapement estimates prior to 1991.

Coho Salmon

The 2008 coho salmon weir escapement of 36,630 fish was above the average escapement since the project was extended to count coho salmon in 1997 (Figure 4; Appendix B1). Weir escapement in 2008 was 40% above the historical 10-year average. This is the first year since 2004 the weir has remained in operation until 15 September. Historically, this time period has coincided with a high abundance of coho salmon. Coho salmon migration timing has been shown to coincide with rising water levels. Typically, coho salmon move in pulses that coincide with even small increases in water levels (Linderman et al. 2003). The weir escapement estimate reported here should be viewed as an index of coho salmon escapement in 2008. Actual escapement past the weir may have been higher due to coho salmon migrating continuing well after the weir operations cease. Daily escapement estimates were made for 15 September through 18 September, to allow for run time consistency with previous years. Daily passage estimates were made using 2004 as a model data set.

Dolly Varden

Dolly Varden counts at the Middle Fork Goodnews River weir date back to 1997. The 2008 Dolly Varden count of 1,416 fish was 49% below the 10-year average of 2,757 from 1998 to 2007 (Figure 5, Appendix B1). Additional details and analysis of Goodnews River Dolly Varden populations can be found in Lisac 2003; 2008, and *In prep.*

The Dolly Varden counts generated by the weir project represent an unknown proportion of the overall Dolly Varden migration within the Middle Fork Goodnews River. The current spacing between weir panel pickets was chosen for optimal weir operations during high water events and for generating escapement counts of Chinook, sockeye, chum, and coho salmon. Findings from Lisac (2003) suggest that the weir count is size selective for larger Dolly Varden and it is believed younger and smaller fish pass through the weir unobserved. The Dolly Varden counts generated at the weir should continue to be considered an index of Dolly Varden populations in the Middle Fork Goodnews River.

RUN TIMING ESTIMATES

Chinook salmon run timing in 2008 was one of the latest runs on record and was 11 days later than the historical median (Table 5; Figure 6). Sockeye salmon run timing in 2008 coincided with the historical median passage date of 8 July. Chum salmon run timing was also late by approximately 5 days compared to the historical median. Coho salmon run timing in 2008 was later compared to the historical median by approximately 3 days (Figures 4 and 6).

RUN ABUNDANCE

Salmon spawn primarily in the North Fork and Middle Fork Rivers of the Goodnews River drainage and their associated lakes. It is thought that less than 10% of salmon returning to the Goodnews River spawn in the South Fork and no estimate is made for this portion of the drainage. Chinook and sockeye salmon escapements were estimated for the North Fork using data from the 2008 aerial survey (Table 4).

The combined escapement estimates from the North Fork and Middle Fork weir are used to characterize Goodnews River drainage-wide escapement (Table 4; Figure 7). Harvest and escapement estimates are combined to estimate total run abundance and exploitation for the Goodnews River drainage (Table 4; Appendix D1 and D2). Chum salmon run abundance for the Goodnews River drainage was not characterized for 2008, as aerial survey counts have been discontinued for chums.

It is difficult to assess the quality or any directional bias of the estimates of total abundance and exploitation. Three main issues affect these estimates: 1) lack of 2008 estimates of subsistence and sport fish harvests, 2) lack of escapement monitoring in the South Fork of the Goodnews River drainage, and 3) the accuracy of using aerial survey proportions between the Middle and North forks. Use of 10-year average sport and subsistence harvests is not thought to have a large affect on estimates of total abundance and exploitation. The direction of the bias in total abundance and exploitation rates is known for the omission of South Fork Chinook and sockeye salmon, resulting in a bias low total abundance and bias high exploitation rate. The bias is thought to be small and in a direction that leads managers to be more conservative to account for its potential effect when making management decisions.

An assumption necessary for an unbiased estimate of total escapement, abundance, and exploitation is that the proportion of observable salmon is equal between aerial surveys conducted upriver from the weir on the Middle Fork and on the North Fork. Differences could arise with differences in environmental conditions or salmon run timing. If a higher proportion of observable salmon are counted above the weir compared to the North Fork, total escapement and abundance will be underestimated and exploitation will be biased high. The reverse will occur if a lower proportion of observable salmon are counted during the aerial survey above the weir compared to the North Fork survey.

Experienced staff have not described any gross differences affecting aerial surveys between forks. Overall depth, water color, riparian vegetation, and substrate type is nearly identical between them, although the Middle Fork drainage is shorter than the North Fork. Aerial surveys of the North Fork and Middle Fork are typically conducted on the same day so conditions and methods used during each survey are also similar. Additionally, it is likely that surveys would be conducted by the same observer on each fork in a given year. These factors combined reduce the

possibility of bias caused by differences in environmental conditions, methods, or different observers employed between both forks.

A different proportion of observable fish between forks may arise if spawning time is not the same or the area surveyed differs. For Chinook and coho salmon, these factors are not as pronounced because they are primarily main channel spawners, their peak spawning period is consistent between areas, and similar areas are surveyed. In contrast, sockeye salmon are primarily lake and lake tributary spawners. The time frame when sockeye salmon enter the lakes and later move into lake tributaries to spawn is a critical factor for sockeye salmon aerial surveys. If few sockeye salmon are observed in the Middle Fork lakes and the lake tributaries are not surveyed, it will be unknown whether abundance was actually low or if the majority of sockeye salmon had already moved into the lake tributaries to spawn. Alternatively, if large numbers of sockeye salmon were observed in North Fork lakes and lake tributaries were not surveyed, it will be unknown whether abundance was high compared to the Middle Fork lakes or if North Fork sockeye salmon had not yet moved into lake tributaries to spawn. In order to reduce this potential for bias, sockeye salmon aerial surveys should be conducted around the perimeter of the lakes but also on the lake spawning tributaries on a consistent annual basis for both forks. Historically, it is unclear whether sockeye aerial surveys of the Goodnews River drainage have consistently included lake tributaries. This uncertainty has been addressed in recent years through improvements and standardization of the Kuskokwim Area aerial survey program and the inclusion of lake spawning tributaries in all sockeye salmon aerial surveys.

There is also potential for directional bias of exploitation rate in 2008 with use of aerial survey proportions to estimate North Fork salmon escapement. The current methodology employed to estimate North Fork escapement uses aerial survey counts to determine the proportion of fish escaping to each fork and applying that proportion to the known Middle Fork weir escapement. If the aerial survey proportion was lower than the actual proportion, exploitation would be biased high. Conversely, if the aerial survey proportion was higher than the actual proportion, exploitation would be biased low. It is unclear in what direction aerial survey proportions may be biasing total abundance and exploitation. However, it can be assumed that 2008 returns were not overexploited given the escapements of Chinook and sockeye salmon in 2008 and the relatively low trends in exploitation rates of Goodnews River stocks. On the contrary, any classification of Goodnews River salmon exploitation in 2008 would most likely be underutilized and it is believed that any potential bias is small and would have a negligible effect on total run and exploitation estimates.

AGE, SEX, AND LENGTH COMPOSITION ESTIMATES

No discussion on ASL trends seen between the Middle Fork Goodnews River weir escapement and District W-5 commercial harvest during 2008 can be made due to lack of ASL W-5 commercial harvest data. Brood tables for 2008 were determined using escapement ASL, and commercial harvest totals partitioned using historical ASL age class data (Tables 1 and 2).

Chinook Salmon

Although sample objectives were not achieved for both the escapement and commercial Chinook salmon ASL estimates in 2008, some inferences can be made based on the samples that were collected. Age-1.3 Chinook salmon were the dominant age class for the aged escapement ASL samples, which is historically age-1.4 (Tables 7). This trend in age composition could be due to the relatively high percentages of age-1.2 fish in 2007 returning in 2008 as age-1.3, which is

consistent with the 2007 prediction made for the 2008 Chinook return. A large return of age-1.3 fish in 2008 returning in 2009 as age-1.4 fish could suggest a return to the historical trend of age-1.4 fish dominant in 2009. An increased number of age-1.4 fish combined with a high number of age-1.3 fish could increase escapement in 2009, if the return of age-1.3 fish remains high. Male to female percentages were near 50-50 for the escapement ASL estimates in 2008. This is inconsistent with historical trends in Chinook salmon sex ratios which is predominantly male (Molyneaux and Folletti 2007*)*.

Sockeye Salmon

Age-1.3 sockeye salmon were the dominant age class in the 2008 escapement ASL estimates, which is consistent with historical ASL data (Table 9). Male to female percentages were near 50–50 for the escapement ASL estimates in 2008, which is consistent with historical totals for escapement and commercial ASL estimates. The escapement ASL estimates do not indicate length partitioning by age class for male or female fish (Figures 9 and 10).

Chum Salmon

Age-0.4 chum salmon were the dominant age class for escapement ASL estimates in 2008, which is inconsistent with the historical dominant age class of age-0.3 for escapement (Table 11). Male to female percentages were predominantly female, for the escapement ASL estimates in 2008, which is inconsistent with historical totals near 50-50 for escapement and commercial ASL estimates. Mean male and female lengths by age class in the 2008 escapement ASL estimates do not indicated length partitioning by age class (Figures 9 and 10).

Coho Salmon

Age-2.1 coho salmon were the dominant age class for escapement ASL estimates in 2008, which is consistent with historical trends in coho salmon escapement (Table 13). Male to female percentages were near 50-50 for the escapement ASL estimates in 2008, which is consistent with historical totals for escapement and commercial ASL estimates. The escapement ASL estimates do not indicate length partitioning by age class for male or female fish (Figures 9 and 10).

CONCLUSIONS

WEIR OPERATIONS

Since the extension of project operations into the coho season in 1997 the project has:

1. Demonstrated the ability to successfully install and operate a weir in Middle Fork Goodnews River during the targeted time frame.
2. Demonstrated the ability to achieve its annual objectives with the exception of ASL sample objectives in specific years.
3. Provided escapement, run timing, and passage information for Middle Fork Goodnews River salmon and Dolly Varden populations.
4. Provided a platform for the collection of ASL information from the salmon escapement and Dolly Varden migration past the weir.

ESCAPEMENT AND RUN ABUNDANCE

Salmon escapement estimates at the weir met or exceeded all establish escapement goals in 2008.

Estimated chum and coho salmon weir escapements were above the recent 10 year averages. Estimated Chinook and sockeye salmon weir escapements were below the recent 10 year averages.

Coho salmon have shown an increasing trend in yearly escapement; however, escapement data for coho salmon is incomplete and no strong inference can be made. Chinook salmon escapement ASL data suggest a possible increase in abundance for 2009 if the percentage of age-1.3 fish in 2008 carries on to age-1.4 fish in 2009. This trend is shown in historical data of these age classes over successive years when the parent year is the same. The 10 year average for sockeye salmon is affect by the record high escapement in 2005 and 2006; however, if the two record escapements were removed the 2008 escapement would have been the third largest escapement on record.

Aerial surveys for Chinook and sockeye salmon were completed in 2008, while chum salmon aerial surveys have been discontinued. Goodnews River Chinook and sockeye salmon drainage-wide escapement was estimated based on the proportion of aerial survey counts between the North and Middle Forks.

Chinook salmon show increasing yearly exploitation rates. However harvest numbers, including 2008, have been relatively stable. Sockeye salmon yearly exploitation rates are variable but still low when compared with other areas of the state. In 2009, a new processing plant is planned to be operational in Platinum, which will create more market demand for Kuskokwim Area salmon stocks and may result in a higher commercial harvest. In recent years the fishery has been limited by the processing capacity of the one buyer operating in the area because of harvest limits placed on individual fishers. The opening on the new plant will allow more processing capacity and should increase the commercial interest in Goodnews Bay salmon stocks and result in higher exploitation rates for salmon.

RECOMMENDATIONS

Annual operation of the Middle Fork Goodnews River weir should continue indefinitely. As the only ground-based monitoring project in District W-5 (Goodnews Bay District), the project provides valuable inseason and postseason information about Chinook, sockeye, chum, and coho salmon that are critical for sustainable salmon management practices.

WEIR OPERATIONS AND ASL SAMPLING

After the season, the substrate rail should be left in the deeper portion of the channel to speed spring installation and startup and be removed from the shallower portion to avoid scouring over the winter. The shallow portion currently extends 80 ft from the north bank. This portion of the river goes dry in the winter and is subject to frost heaving, which displaces the rail and causes scouring during the spring flood.

Active sampling for Chinook salmon should continue in order to meet ASL sample size goals and additional live traps should be deployed when time and funding allows to accommodate additional Chinook salmon ASL sample collection. The sampling goals for Chinook salmon may

be unreasonable given the size of the runs at the Goodnews River weir and should be re-evaluated to better represent the irregular passage and lower abundance of Chinook salmon through the weir. The current sampling goals at the Goodnews River weir have not been met and are anticipated to remain difficult to achieve in subsequent years.

Collection of commercial samples from the District 5 (Goodnews Bay) has been problematic due to the fish being tendered to Quinhagak for processing. A new processing plant located in Platinum is expected to be operational in 2009 and should alleviate some of the problems encountered in the past with obtaining samples from commercially harvested salmon in District 5.

FISH PASSAGE AND ESCAPEMENT ESTIMATION

Continued effort is recommended to obtain aerial survey information on the Middle Fork and North Fork Rivers of the Goodnews drainage to estimate total escapement of Chinook and sockeye salmon.

Additional efforts are recommended to generate more accurate Dolly Varden weir counts. This is difficult to achieve as the current spacing between weir panel pickets was chosen for optimal weir operations during high water events while insuring escapement counts for returning adult Chinook, sockeye, chum, and coho salmon, which are larger in size overall compared to Dolly Varden. To preclude Dolly Varden from passing through the pickets, major weir modifications would be required, which would reduce the weir's effectiveness during higher water events. A methodology supplementing the current weir is needed to achieve more accurate assessments of Middle Fork Goodnews River Dolly Varden populations.

Implementing a target operational period and developing methods for estimating salmon passage missed during this period as described in Linderman et al. (2004) is also recommended.

HARVEST AND EXPLOITATION

Results of brood table analysis and development of BEGs for Middle Fork Chinook and sockeye salmon has indicated Goodnews River Chinook and sockeye salmon stocks can be sustained at higher levels of exploitation. Management actions that could be taken to increase harvest include more frequent openings, longer openings, and increasing net lengths from one to two shackles. Increasing harvest has been difficult in district W-5 due to low fishing effort and limited processing capacity. It is anticipated that the new processing plant in Platinum will increase the harvest of salmon in the Goodnews Bay commercial fishery and result in higher exploitation rates than is currently observed in the District 5 fishery. The anticipated increase in commercial fishing in Goodnews Bay is unlikely to adversely affect salmon stocks in the Goodnews River Drainage.

HISTORICAL DATA EVALUATION

There is a need to continue to revisit historical data regarding the Goodnews River drainage and verify data to check for correctness, consistency, and completion. Further evaluation is also needed for Middle Fork Goodnews River weir escapement estimates, as target operational dates are inconsistent between years and some years lack estimates when the weir was not operational. The lack of expansion and estimates in a given year has caused staff to underestimate the number of salmon that escape into the Middle Fork Goodnews River weir. This in turn could result in

over estimates of exploitation, less accurate escapement goals, and less affect management decisions.

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TABLES AND FIGURES

Table 1.–Brood table for Middle Fork Goodnews River Chinook salmon.

Year	MF Escapement	Age 2	Age 3	Age 4	Age5	Age 6	Age 7	Age 8	Total Recruits	yield	Recruits/ Spawner
1981	3,688	0	7	1,232	1,968	2,370	599	0	6,176	2,488	1.7
1982	1,395	0	30	489	1,306	2,554	228	0	4,609	3,214	3.3
1983	6,027	0	15	495	1,209	2,136	264	9	4,128	-1,899	0.7
1984	3,260	0	16	681	1,615	2,386	271	0	4,969	1709	1.5
1985	2,831	0	0	242	899	971	109	0	2,221	-610	0.8
1986	2,080	0	14	1,846	984	1,712	207	0	4,762	2,682	2.3
1987	2,272	0	26	578	1,231	1,561	604	0	4,000	1728	1.8
1988	2,712	0	0	628	964	2,614	49	1	4,256	1,544	1.6
1989	1,915	0	41	949	1,781	3,846	201	0	6,817	4,902	3.6
1990	3,636	0	17	427	1,080	1,722	10	0	3,256	-380	0.9
1991	1,952	0	65	1,643	1,100	1,167	275	0	4,250	2,298	2.2
1992	1,905	0	0	781	358	2,034	93	0	3,267	1,362	1.7
1993	2,349	0	30	2,114	4,044	2,743	65	0	8,997	6648	3.8
1994	3,856	0	24	786	606	1,048	234	0	2,698	-1,158	0.7
1995	4,836	0	142	1,156	3,073	4,568	145	0	9,084	4,248	1.9
1996	2,931	0	23	813	1,278	1,526	138	0	3,778	847	1.3
1997	2,937	0	28	351	1,021	1,129	42	0	2,571	-366	0.9
1998	4,584	0	51	1,309	1,272	1,024	9	0	3,666	-918	0.8
1999	3,221	0	7	526	1,251	1,285	107	0	3,177	-44	1.0
2000	2,500	0	81	2,886	3,366	1,853	152	0	8,338	5,838	3.3
2001	5,351	0	124	1,084	1,559	2,019	181	0	4,967	-384	0.9
2002	3,085	0	6	1,998	1,404	932	0	0	4,340		
2003	2,389	0	66	1,945	1,460	0	0	0	3,471		
2004	4,388	0	46	705	0	0	0	0	752		
2005	4,633	0	162	0	0	0	0	0	162		
2006	4,559	0	0	0	0	0	0	0	0		
2007	3,852	0	0	0	0	0	0	0	0		
2008	2,158	0	0	0	0	0	0	0	0		
Average											1.7

Note: Only data bordered by black line were used in spawner-recruit analysis. Commercial Harvest ASL data was not collected for 2008. Harvest age class was determined using 2008 Harvest total and historical age class return percentages.

Table 2.–Brood table for Middle Fork Goodnews River sockeye salmon.

Year	MF Escapement	Age 3	Age 4	Age5	Age 6	Age 7	Total Recruit	Yield	Recruit/Spawner
1981	49,108	41	8,929	64,113	1,155	21	74,258	25,150	1.5
1982	56,255	31	4,111	40,635	1,423	0	46,200	-10,055	0.8
1983	25,816	0	3,114	32,033	2,213	0	37,360	11,544	1.4
1984	32,053	0	2,994	30,857	5,585	0	39,435	7,382	1.2
1985	24,131	21	2,159	34,837	3,806	209	41,032	16,901	1.7
1986	51,069	0	14,232	63,441	4,008	209	81,890	30,821	1.6
1987	28,871	539	6,084	29,112	5,351	57	41,142	12,271	1.4
1988	15,799	265	17,596	38,795	7,039	0	63,695	47,896	4.0
1989	21,186	1,817	20,045	82,777	5,620	36	110,295	89,109	5.2
1990	31,679	353	5,686	49,954	4,387	260	60,640	28,961	1.9
1991	47,397	0	7,390	68,200	8,064	65	83,718	36,321	1.8
1992	27,268	0	5,446	35,537	6,551	145	47,679	20,411	1.7
1993	26,452	82	11,125	51,444	4,729	0	67,378	40,926	2.5
1994	50,801	150	13,136	49,823	2,399	0	65,508	14,707	1.3
1995	39,009	0	9,292	51,716	4,208	78	65,295	26,286	1.7
1996	58,290	0	3,214	23,942	2,537	0	29,694	-28,596	0.5
1997	35,530	0	837	10,369	3,777	0	14,983	-20,547	0.4
1998	49,513	0	13,027	46,901	5,612	0	65,540	16,027	1.3
1999	48,205	0	4,840	40,651	6,118	0	51,609	3,404	1.1
2000	32,341	0	20,946	101,610	11,088	0	133,644	101,303	4.1
2001	21,024	0	17,555	100,679	5,088	42	123,364	102,340	5.9
2002	22,101	0	29,120	52,335	5,929	0	87,384	65,283	4.0
2003	44,387	0	38,211	60,849	0	0	99,060		
2004	55,926	361	10,764	0	0	0	11,125		
2005	113,809	99	0	0	0	0	99		
2006	126,772	0	0	0	0	0	0		
2007	72,282	0	0	0	0	0	0		
2008	51,763	0	0	0	0	0	0		
Average									2.2

Note: Only data bordered by black line were used in spawner-recruit analysis. Commercial Harvest ASL data was not collected for 2008. Harvest age class was determined using 2008 Harvest total and historical age class return percentages.

Table 3.–Daily and cumulative Chinook, sockeye, chum, and coho salmon passage, Middle Fork Goodnews River weir, 2008.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/25	0	0	0	0	0	0	0	0
6/26	0	0	302 [a]	302	284 [a]	284	0	0
6/27	0	0	2,277 [a]	2,579	120 [a]	404	0	0
6/28	0	0	1,728 [a]	4,307	225 [a]	629	0	0
6/29	0	0	1,532 [a]	5,839	855 [a]	1,484	0	0
6/30	0	0	1,885 [a]	7,725	1,391 [a]	2,875	0	0
7/01	0	0	2,044 [a]	9,768	1,688 [a]	4,563	0	0
7/02	2	2	2,145 [a]	11,913	749 [a]	5,312	0	0
7/03	22	24	1,483	13,396	40	5,352	0	0
7/04	59	83	2,156	15,552	210	5,562	0	0
7/05	40	123	1,929	17,481	118	5,680	0	0
7/06	28	151	1,970	19,451	665	6,345	0	0
7/07	82	233	3,121	22,572	952	7,297	0	0
7/08	68	301	2,454	25,026	340	7,637	0	0
7/09	20	321	2,342	27,368	329	7,966	0	0
7/10	17	338	1,227	28,595	337	8,303	0	0
7/11	32	370	1,825	30,420	713	9,016	0	0
7/12	58	428	1,960	32,380	838	9,854	0	0
7/13	50	478	2,008	34,388	1,432	11,286	0	0
7/14	162	640	2,002	36,390	2,689	13,975	0	0
7/15	46	686	1,644	38,034	1,100	15,075	0	0
7/16	90 [b]	776	1,589 [a]	39,623	1,616 [b]	16,691	0	0
7/17	76 [b]	852	1,355 [a]	40,978	1,339 [b]	18,030	0	0
7/18	61 [b]	913	1,120 [a]	42,098	1,061 [b]	19,091	0	0
7/19	84	997	1,034	43,132	841	19,932	0	0
7/20	10	1,007	738	43,870	724	20,656	0	0
7/21	42	1,049	548	44,418	340	20,996	0	0
7/22	59 [b]	1,108	646 [a]	45,064	903 [b]	21,899	1	1
7/23	100	1,208	800	45,864	792	22,691	2	3
7/24	86	1,294	499	46,363	1,756	24,447	0	3
7/25	83	1,377	351	46,714	1,222	25,669	4	7
7/26	125	1,502	285	46,999	1,246	26,915	38	45
7/27	55	1,557	192	47,191	485	27,400	7	52
7/28	89	1,646	282	47,473	1,239	28,639	15	67
7/29	60	1,706	189	47,662	1,542	30,181	8	75
7/30	82	1,788	208	47,870	2,057	32,238	68	143
7/31	77	1,865	255	48,125	1,990	34,228	13	156
8/01	50	1,915	268	48,393	1,245	35,473	18	174
8/02	47	1,962	216	48,609	1,729	37,202	18	192

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Table 3.–Page 2 of 3.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
8/03	36 [b]	1,998	198 [b]	48,807	1,203 [b]	38,405	30 [b]	222
8/04	16	2,014	190	48,997	1,275	39,680	50	272
8/05	30	2,044	116	49,113	564	40,244	35	307
8/06	19	2,063	138	49,251	545	40,789	28	335
8/07	14	2,077	147	49,398	864	41,653	63	398
8/08	13	2,090	152	49,550	576	42,229	65	463
8/09	9	2,099	111	49,661	379	42,608	41	504
8/10	10	2,109	108	49,769	353	42,961	95	599
8/11	6	2,115	85	49,854	195	43,156	64	663
8/12	4	2,119	44	49,898	291	43,447	47	710
8/13	7	2,126	78	49,976	203	43,650	49	759
8/14	5	2,131	74	50,050	188	43,838	163	922
8/15	1	2,132	47	50,097	107	43,945	70	992
8/16	0	2,132	44	50,141	62	44,007	21	1,013
8/17	3	2,135	53	50,194	105	44,112	85	1,098
8/18	2	2,137	32	50,226	136	44,248	205	1,303
8/19	1	2,138	27	50,253	105	44,353	531	1,834
8/20	1	2,139	47	50,300	80	44,433	797	2,631
8/21	3	2,142	32	50,332	56	44,489	613	3,244
8/22	4	2,146	22	50,354	40	44,529	329	3,573
8/23	1	2,147	12	50,366	16	44,545	191	3,764
8/24	2	2,149	21	50,387	29	44,574	719	4,483
8/25	2	2,151	9	50,396	24	44,598	1,493	5,976
8/26	4	2,155	3	50,399	5	44,603	411	6,387
8/27	1	2,156	4	50,403	14	44,617	601	6,988
8/28	1	2,157	3	50,406	15	44,632	1,112	8,100
8/29	0	2,157	0	50,406	2	44,634	395	8,495
8/30	1	2,158	13	50,419	8	44,642	1,994	10,489
8/31	0	2,158	7	50,426	8	44,650	2,230	12,719
9/01	0	2,158	1	50,427	5	44,655	684	13,403
9/02	1	2,159	2	50,429	10	44,665	2,736	16,139
9/03	0	2,159	3	50,432	7	44,672	1,764	17,903
9/04	1	2,160	4	50,436	5	44,677	1,057	18,960
9/05	1	2,161	2	50,438	4	44,681	1,451	20,411
9/06	0	2,161	0	50,438	5	44,686	1,031	21,442
9/07	0	2,161	2	50,440	1	44,687	1,102	22,544
9/08	0	2,161	3	50,443	3	44,690	1,535	24,079
9/09	0	2,161	2	50,445	0	44,690	942	25,021
9/10	0	2,161	4	50,449	1	44,691	1,329	26,350
9/11	0	2,161	3	50,452	1	44,692	1,801	28,151

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Table 3.–Page 3 of 3.

	Chinook		Sockeye		Chum		Coho	
Date	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
9/12	0	2,161	3	50,455	0	44,692	605	28,756
9/13	0	2,161	2	50,457	5	44,697	2,832	31,588
9/14	0	2,161	0	50,457	0	44,697	1,197	32,785
9/15	0 [a]	2,161	2 [a]	50,459	2 [a]	44,699	1,508 [a]	34,293
9/16	0 [a]	2,161	0 [a]	50,459	0 [a]	44,699	1,122 [a]	35,415
9/17	0 [a]	2,161	0 [a]	50,459	0 [a]	44,699	624 [a]	36,039
9/18	0 [a]	2,161	0 [a]	50,459	0 [a]	44,699	591 [a]	36,630
Total	2,161		50,459		44,699		36,630	
Observed	1,994		35,688		35,350		33,099	
Estimated	167		14,771		9,349		3,531	
% Observed	92.27		70.73		79.08		90.36	

[a] Daily passage was estimated because of a breach in the weir.

[b] The weir was not operational; daily passage was estimated

Table 4.–Escapement summary for the Goodnews River, 2008.

Middle Fork Goodnews River escapement estimate

	Chinook	Sockeye	Chum	Coho
2008 weir count	2,161	50,459	44,699	36,630
Weir (SEG)	2,000–4,500	23,000–58,000	>12,000	>12,000
10-year average (1998–2007)	3,856	58,636	30,318	26,218
2008 aerial survey count	1,940	13,935	[a]	[a]

North Fork Goodnews River escapement estimate

	Chinook	Sockeye	Chum	Coho
2008 escapement estimate	2,641	117,683	[a]	[a]
10-year average (1998–2007)	6,339	60,855	[a]	[a]
2008 aerial survey count	2,371	32,500	[a]	[a]
Aerial Survey (SEG)	640–3,300	5,500–19,500	[b]	[b]

Goodnews River (total drainage) escapement estimate

	Chinook	Sockeye	Chum	Coho
2008	4,802	168,142	[a]	[a]
10-year average (1998–2007)	13,540	147,228	[b]	[b]

Total Run and Exploitation

	Chinook	Sockeye	Chum	Coho
District W-5 Commercial Harvest	1,281	27,236	10,340	22,547
Subsistence Harvest [c]	730	800	7	36
Sport Fishing Harvest [c]	163	45	0	211
Total Run Estimate	6,976	196,223	[a]	[a]
Harvest Exploitation (%)	31.2	14.3	[a]	[a]

[b] No estimate was made.

[c] Escapement goal discontinued in 2004.

[d] Official estimates not available at time of publication, numbers shown are the recent 10 year averages (1996–2005) of Goodnews Bay area subsistence and Goodnews River sport fishing harvest.

Table 5.–Chinook, sockeye, chum, and coho salmon and Dolly Varden cumulative percent passage, Middle Fork Goodnews River weir, 2008 and historical median.

	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2008	Median[a]	2008	Median[b]	2008	Median[c]	2008	Median[d]	2008	Median[e]
6/25		3		7		1	0			0
6/26		4	1	7	1	1	0			0
6/27		6	5	9	1	1	0			0
6/28		8	9	12	1	2	0			1
6/29		9	12	15	3	2	0			1
6/30		12	15	18	6	3	0			1
7/01		15	19	25	10	5	0			2
7/02	0	18	24	28	12	6	0	0	0	3
7/03	1	20	27	28	12	7	0	0	0	4
7/04	4	22	31	33	12	9	0	0	0	6
7/05	6	24	35	39	13	11	0	0	0	8
7/06	7	29	39	44	14	13	0	0	0	9
7/07	11	34	45	49	16	16	0	0	1	9
7/08	14	37	50	55	17	18	0	0	1	11
7/09	15	40	54	57	18	19	0	0	3	13
7/10	16	46	57	63	19	23	0	0	3	14
7/11	17	50	60	67	20	25	0	0	4	22
7/12	20	57	64	73	22	32	0	0	4	22
7/13	22	58	68	75	25	35	0	0	4	23
7/14	30	62	72	78	31	38	0	0	7	23
7/15	32	64	75	80	34	41	0	0	9	24
7/16	36	68	79	82	37	43	0	0	9	27
7/17	39	70	81	84	40	48	0	0	11	34
7/18	42	75	83	87	43	53	0	0	14	43
7/19	45	78	85	88	45	58	0	0	20	51
7/20	47	81	87	89	46	61	0	0	32	56
7/21	49	83	88	91	47	64	0	0	41	61
7/22	51	83	89	92	49	67	0	0	49	63
7/23	56	85	91	93	51	71	0	0	59	65
7/24	60	87	92	94	55	74	0	0	66	66
7/25	64	88	93	95	57	76	0	0	70	67
7/26	70	89	93	96	60	80	0	0	75	68
7/27	72	91	94	96	61	81	0	0	78	69
7/28	76	92	94	96	64	83	0	0	80	73
7/29	79	93	94	97	68	85	0	0	82	78
7/30	83	94	95	97	72	87	0	0	83	80
7/31	86	94	95	98	77	89	0	0	86	82
8/01	89	95	96	98	79	91	0	0	87	84

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	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2008	Median [a]	2008	Median [b]	2008	Median[c]	2008	Median [d]	2008	Median[e]
8/02	91	95	96	98	83	92	1	0	89	87
8/03	92	97	97	98	86	93	1	0	89	89
8/04	93	98	97	98	89	94	1	0	90	90
8/05	95	98	97	98	90	95	1	0	91	92
8/06	95	98	98	99	91	96	1	0	91	93
8/07	96	98	98	99	93	96	1	1	91	93
8/08	97	98	98	99	94	97	1	1	92	94
8/09	97	98	98	99	95	97	1	1	92	94
8/10	98	98	99	99	96	98	2	1	92	95
8/11	98	98	99	99	97	98	2	1	92	95
8/12	98	99	99	99	97	98	2	2	93	95
8/13	98	99	99	99	98	99	2	2	93	96
8/14	99	99	99	99	98	99	3	3	93	96
8/15	99	99	99	99	98	99	3	4	94	96
8/16	99	99	99	99	98	99	3	5	94	96
8/17	99	99	99	99	99	99	3	6	94	96
8/18	99	99	100	99	99	99	4	7	94	97
8/19	99	99	100	99	99	99	5	8	95	97
8/20	99	100	100	99	99	100	7	9	95	97
8/21	99	100	100	100	100	100	9	11	95	97
8/22	99	100	100	100	100	100	10	12	95	98
8/23	99	100	100	100	100	100	10	14	95	98
8/24	99	100	100	100	100	100	12	16	95	98
8/25	100	100	100	100	100	100	16	18	95	98
8/26	100	100	100	100	100	100	17	24	96	98
8/27	100	100	100	100	100	100	19	27	96	98
8/28	100	100	100	100	100	100	22	34	96	98
8/29	100	100	100	100	100	100	23	34	96	98
8/30	100	100	100	100	100	100	29	44	96	98
8/31	100	100	100	100	100	100	35	49	97	98
9/01	100	100	100	100	100	100	37	51	97	99
9/02	100	100	100	100	100	100	44	55	97	99
9/03	100	100	100	100	100	100	49	60	98	99
9/04	100	100	100	100	100	100	52	65	98	99
9/05	100	100	100	100	100	100	56	69	98	99
9/06	100	100	100	100	100	100	59	74	98	99
9/07	100	100	100	100	100	100	62	82	98	100
9/08	100	100	100	100	100	100	66	83	98	100
9/09	100	100	100	100	100	100	68	84	98	100

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	Chinook Salmon		Sockeye Salmon		Chum Salmon		Coho Salmon		Dolly Varden	
Date	2008	Median [a]	2008	Median [b]	2008	Median[c]	2008	Median [d]	2008	Median[e]
9/10	100	100	100	100	100	100	72	85	99	100
9/11	100	100	100	100	100	100	77	86	99	100
9/12	100	100	100	100	100	100	79	91	100	100
9/13	100	100	100	100	100	100	86	94	100	99
9/14	100	100	100	100	100	100	90	95	100	99
9/15	100	100	100	100	100	100	94	96	100	99
9/16	100	100	100	100	100	100	97	97	100	99
9/17	100	100	100	100	100	100	98	98	100	100
9/18	100	100	100	100	100	100	100	100	100	100

Note: Boxes represent the central 50% of the run and median date of passage. Shaded areas represent the central 80% of the run.

[a] Historical median for years: 1981, 1990–1997, 1999, and 2001–2005.

[b] Historical median for years: 1981, 1984, 1992–1997, 1999, and 2002–2005.

[c] Historical median for years: 1981, 1991–1997, 1999, and 2001–2005.

[d] Historical median for years: 1997–2005.

[e] Historical median for years: 1997–2005.

Table 6.–Daily and cumulative pink salmon and Dolly Varden passage, Middle Fork Goodnews River weir, 2008.

	Pink Salmon		Dolly Varden	
Date	Daily	Cum.	Daily	Cum.
6/25	0	0	0	0
6/26	0	0	0	0
6/27	0	0	0	0
6/28	0	0	0	0
6/29	0	0	0	0
6/30	0	0	0	0
7/01	0	0	0	0
7/02	16 [a]	16	1 [a]	1
7/03	11	27	0	1
7/04	16	43	0	1
7/05	8	51	2	3
7/06	31	82	1	4
7/07	154	236	4	8
7/08	114	350	11	19
7/09	83	433	20	39
7/10	41	474	4	43
7/11	71	545	10	53
7/12	93	638	5	58
7/13	88	726	5	63
7/14	91	817	34	97
7/15	122	939	25	122
7/16	34 [a]	973 [a]	8	130
7/17	56 [a]	1,029 [a]	23	153
7/18	77 [a]	1,106 [a]	49	202
7/19	135	1,241	79	281
7/20	100	1,341	171	452
7/21	59	1,400	128	580
7/22	48 [a]	1,448	116 [a]	696
7/23	175	1,623	138	834
7/24	234	1,857	102	936
7/25	204	2,061	57	993
7/26	245	2,306	64	1,057
7/27	87	2,393	52	1,109
7/28	210	2,603	21	1,130
7/29	200	2,803	26	1,156
7/30	264	3,067	19	1,175
7/31	372	3,439	38	1,213
8/01	317	3,756	14	1,227
8/02	537	4,293	30	1,257
8/03	132 [a]	4,425	5 [a]	1,262
8/04	439	4,864	7	1,269
8/05	315	5,179	14	1,283
8/06	364	5,543	7	1,290
8/07	563	6,106	3	1,293
8/08	387	6,493	6	1,299

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Date	Pink Salmon		Dolly Varden	
	Daily	Cum.	Daily	Cum.
8/09	223	6,716	5	1,304
8/10	394	7,110	3	1,307
8/11	287	7,397	2	1,309
8/12	165	7,562	4	1,313
8/13	249	7,811	5	1,318
8/14	343	8,154	3	1,321
8/15	241	8,395	7	1,328
8/16	230	8,625	4	1,332
8/17	158	8,783	1	1,333
8/18	101	8,884	3	1,336
8/19	218	9,102	4	1,340
8/20	130	9,232	5	1,345
8/21	74	9,306	2	1,347
8/22	58	9,364	1	1,348
8/23	33	9,397	1	1,349
8/24	48	9,445	2	1,351
8/25	32	9,477	1	1,352
8/26	52	9,529	5	1,357
8/27	20	9,549	2	1,359
8/28	21	9,570	2	1,361
8/29	7	9,577	0	1,361
8/30	44	9,621	2	1,363
8/31	23	9,644	12	1,375
9/01	17	9,661	3	1,378
9/02	30	9,691	2	1,380
9/03	38	9,729	3	1,383
9/04	20	9,749	6	1,389
9/05	12	9,761	1	1,390
9/06	5	9,766	1	1,391
9/07	4	9,770	0	1,391
9/08	8	9,778	2	1,393
9/09	9	9,787	1	1,394
9/10	8	9,795	2	1,396
9/11	2	9,797	12	1,408
9/12	1	9,798	1	1,409
9/13	1	9,799	5	1,414
9/14	3	9,802	0	1,414
9/15	5	9,807	2	1,416
9/16	[b]	9,807	[b]	1,416
9/17	[b]	9,807	[b]	1,416
9/18	[b]	9,807	[b]	1,416
Total	9,807		1,416	

[a] Partial day counts because of a breach in weir, no estimates were made.

[b] The weir was not operational; daily passage was not estimated.

Table 7.–Age and sex composition of Chinook salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc.	1.1 %	1.2 Esc.	1.2 %	1.3 Esc.	1.3 %	1.4 Esc.	1.4 %	2.3 Esc.	2.3 %	1.5 Esc.	1.5 %	2.4 Esc.	2.4 %	Total Esc.	Total %
7/6 7/8 7/10	27	24	M	0	0.0	143	33.3	89	20.8	36	8.4	0	0.0	0	0.0	0	0.0	268	62.5
(7/2-7/12)			F	0	0.0	0	0.0	107	25.0	35	8.3	0	0.0	18	4.2	0	0.0	160	37.5
			Subtotal	0	0.0	143	33.3	196	45.8	71	16.7	0	0.0	18	4.2	0	0.0	428	100.0
7/14 7/15 7/19	12	6	M	103	16.7	103	16.7	0	0.0	0	0.0	0	0.0	103	16.7	0	0.0	311	50.0
(7/13-7/21)			F	0	0.0	0	0.0	207	33.3	103	16.7	0	0.0	0	0.0	0	0.0	310	50.0
			Subtotal	103	16.7	103	16.7	207	33.3	103	16.7	0	0.0	103	16.7	0	0.0	621	100.0
7/23-7/27	87	76	M	10	1.3	68	9.2	156	21.1	78	10.5	0	0.0	0	0.0	0	0.0	312	42.1
(7/22-7/30)			F	0	0.0	0	0.0	214	28.9	204	27.7	0	0.0	10	1.3	0	0.0	428	57.9
			Subtotal	10	1.3	68	9.2	370	50.0	282	38.2	0	0.0	10	1.3	0	0.0	740	100.0
8/2-9/4	18	17	M	44	11.8	66	17.6	110	29.4	22	5.9	0	0.0	22	5.9	0	0.0	263	70.6
(7/31-9/15)			F	0	0.0	0	0.0	44	11.8	66	17.6	0	0.0	0	0.0	0	0.0	110	29.4
			Subtotal	44	11.8	66	17.6	154	41.2	88	23.5	0	0.0	22	5.9	0	0.0	373	100.0
Season	144	123	M	157	7.3	380	17.6	355	16.4	136	6.3	0	0.0	125	5.8	0	0.0	1,153	53.3
			F	0	0.0	0	0.0	572	26.5	409	18.9	0	0.0	28	1.3	0	0.0	1,009	46.7
			Subtotal	157	7.3	380	17.6	927	42.9	545	25.2	0	0.0	153	7.1	0	0.0	2,162	100.0
Grand Total [a]		1,415	M	339	1.6	5,812	26.7	4,406	20.2	2,923	13.4	12.0	0.1	190	0.9	0.0	0.0	13,691	62.9
			F	0	0.0	56	0.3	2,054	9.4	5,616	25.8	0.0	0.0	304	1.4	60.0	0.3	8,078	37.1
			Total	339	0.0	5,868	27.0	6,459	29.7	8,539	39.2	12.0	0.1	494	2.3	60.0	0.3	21,770	100.0

Note: The numbers of fish in each stratum age and sex category are derived from the sample percentages; discrepancies are attributed to rounding errors.

[a] The number of fish in "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1991, 1995, 1997, 2000, 2002–2003, and 2007–2008.

Table 8.–Mean length (mm) of Chinook salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5	2.4
7/6 7/8 7/10 (7/2-7/12)	M	Mean Length		539	648	779		
		Std. Error		14	39	51		
		Range		490-622	592-803	728-830		
		Sample Size	0	8	5	2	0	0
	F	Mean Length			770	833	922	
		Std. Error			28	3	-	
		Range			690-870	830-835	922-922	
		Sample Size	0	0	6	2	1	0
7/14 7/15 7/19 (7/13-7/21)	M	Mean Length	371	464			990	
		Std. Error	-	-			-	
		Range	371-371	464-464			990-990	
		Sample Size	1	1	0	0	1	0
	F	Mean Length			600	815		
		Std. Error			238	-		
		Range			362-837	815-815		
		Sample Size	0	0	2	1	0	0
7/23-7/27 (7/22-7/30)	M	Mean Length	267	568	764	839		
		Std. Error	-	21	14	27		
		Range	267-267	492-665	661-861	674-930		
		Sample Size	1	7	16	8	0	0
	F	Mean Length			794	846	896	
		Std. Error			11	12	-	
		Range			680-900	755-956	896-896	
		Sample Size	0	0	22	21	1	0
8/2-9/4 (7/31-9/15)	M	Mean Length	366	586	656	828	904	
		Std. Error	25	30	33	-	-	
		Range	341-390	525-621	585-778	828-828	904- 904	
		Sample Size	2	3	5	1	1	0
	F	Mean Length			798	846		
		Std. Error			31	19		
		Range			766-829	815-881		
		Sample Size	0	0	2	3	0	0

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Table 8.–Page 2 of 2.

Sample Dates (Stratum Dates)	Sex		Age Class 1.1	1.2	1.3	1.4	1.5	2.4
	M	Mean Length	363	532	701	822	975	
Season		Range	267-390	464-665	585-861	674-930	904-990	
		Sample Size	4	19	26	11	2	0
	F	Mean Length			719	837	913	
		Range			362-900	755-956	896-922	
		Sample Size	0	0	32	27	2	0
Grand Total [a]	M	Mean Length	373	542	711	847	904	
		Range	240-550	360-850	550-910	680-1,035	700-990	
		Sample Size	18	315	321	192	8	0
	F	Mean Length		610	776	852	892	822
		Range		540-670	560-880	470-1,005	705-990	732-872
		Sample Size	0	3	142	386	23	4

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1991, 1995, 1997, 2000, 2002–2003 and 2007–2008.

Table 9.–Age and sex composition of sockeye salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	1.2 Esc.	1.2 %	0.4 Esc.	0.4 %	1.3 Esc.	1.3 %	2.2 Esc.	2.2 %	1.4 Esc.	1.4 %	2.3 Esc.	2.3 %	Total Esc.	Total %
7/6-7/09	284	149	M	0	0.0	735	2.7	367	1.3	0	0.0	10,654	38.9	0	0.0	735	2.7	551	2.0	13,042	47.7
(6/26-7/9)			F	0	0.0	918	3.3	919	3.4	0	0.0	11,388	41.6	184	0.7	367	1.3	551	2.0	14,327	52.3
			Subtotal	0	0.0	1,653	6.0	1,286	4.7	0	0.0	22,042	80.5	184	0.7	1,102	4.0	1,102	4.0	27,369	100.0
7/14 7/15	96	62	M	0	0.0	0	0.0	172	1.6	0	0.0	3,785	35.5	0	0.0	0	0.0	0	0.0	3,957	37.1
(7/10-7/15)			F	0	0.0	172	1.6	688	6.5	0	0.0	5,161	48.4	172	1.6	344	3.2	172	1.6	6,709	62.9
			Subtotal	0	0.0	172	1.6	860	8.1	0	0.0	8,946	83.9	172	1.6	344	3.2	172	1.6	10,666	100.0
7/19-8/22	514	301	M	0	0.0	82	0.7	743	6.0	41	0.3	3,715	29.9	83	0.7	82	0.7	124	1.0	4,871	39.2
(7/16-9/15)			F	0	0.0	289	2.3	1,734	13.9	83	0.7	4,912	39.5	82	0.6	124	1.0	330	2.7	7,553	60.8
			Subtotal	0	0.0	371	3.0	2,477	19.9	124	1.0	8,627	69.4	165	1.3	206	1.7	454	3.7	12,424	100.0
Season	894	512	M	0	0.0	817	1.6	1,282	2.6	41	0.1	18,153	36.0	83	0.1	818	1.6	675	1.3	21,869	43.3
			F	0	0.0	1,380	2.8	3,340	6.6	83	0.1	21,461	42.5	438	0.9	835	1.7	1,053	2.1	28,590	56.7
			Subtotal	0	0.0	2,197	4.4	4,622	9.2	124	0.2	39,614	78.5	521	1.0	1,653	3.3	1,728	3.4	50,459	100.0
Grand Total [a]		8,428	M	239	0.0	11,166	1.6	37,802	5.3	275	0.0	252,425	35.6	5,520	0.8	11,547	1.6	15,783	2.2	335,389	47.4
			F	0	0.0	8,551	1.2	72,519	10.2	487	0.1	260,746	36.8	7,653	1.1	8,450	1.2	13,847	2.0	372,810	52.6
			Total	239	0.0	19,717	2.8	110,321	15.6	762	0.1	513,171	72.5	13,173	1.9	19,997	2.8	29,630	4.2	708,196	100.0

Note: The numbers of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The numbers of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums and include years 1987, 1990, 1995, 1997, and 1999–2008. Minor age classes that were not present in 2007 samples are included in the "Grand Total" summation; however, those minor age classes are not presented in the Age Class columns.

Table 10.–Mean length (mm) of sockeye salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates			Age Class						
(Stratum Dates)	Sex		0.3	1.2	0.4	1.3	2.2	1.4	2.3
7/6-7/09	M	Mean Length	575	502		569		591	588
(6/26-7/9)		Std. Error	20	1		4		8	16
		Range	548-633	501-503		500-620		571-608	556-605
		Sample Size	4	2	0	58	0	4	3
	F	Mean Length	530	474		527	452	559	527
		Std. Error	10	12		3	-	5	13
		Range	500-555	457-521		420-581	452-452	554-563	503-546
		Sample Size	5	5	0	62	1	2	3
7/14 7/15	M	Mean Length		499		566			
(7/10-7/15)		Std. Error		-		7			
		Range		499-499		471-612			
		Sample Size	0	1	0	22	0	0	0
	F	Mean Length	552	481		540	462	556	512
		Std. Error	-	11		6	-	5	-
		Range	552-552	453-505		475-652	462-462	551-561	512-512
		Sample Size	1	4	0	30	1	2	1
7/19-8/22	M	Mean Length	593	510	584	568	504	588	587
(7/16-9/15)		Std. Error	17	9	-	3	4	1	12
		Range	576-609	428-562	584-584	508-621	500-507	586-589	565-607
		Sample Size	2	18	1	90	2	2	3
	F	Mean Length	542	496	568	533	517	538	537
		Std. Error	7	5	1	2	5	13	16
		Range	508-563	431-572	567-569	462-594	512-521	523-563	469-617
		Sample Size	7	42	2	119	2	3	8
Season	M	Mean Length	577	506	584	568	504	591	588
		Range	548-633	428-562	584-584	471-621	500-507	571-608	556-607
		Sample Size	6	21	1	170	2	6	6
	F	Mean Length	535	487	568	532	468	554	528
		Range	500-563	431-572	567-569	420-652	452-521	523-563	469-617
		Sample Size	13	51	2	211	4	7	12
Grand	M	Mean Length	578	527	580	578	534	600	576
Total [a]		Range	568-622	455-625	465-625	425-630	495-645	470-700	499-611
		Sample Size	79	500	7	2,901	76	135	188
	F	Mean Length	543	494	566	543	488	553	533
		Range	470-595	429-597	490-595	415-687	453-595	438-635	450-566
		Sample Size	90	1,036	8	2,995	133	104	149

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1987, 1990, 1995, 1997, and 1999–2008.

Table 11.–Age and sex composition of chum salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	0.4 Esc.	0.4 %	0.5 Esc.	0.5 %	Total Esc.	Total %
7/6-7/10	264	224	M	0	0.0	1,276	12.9	2,904	29.5	616	6.2	4,795	48.7
(6/26-7/12)			F	44	0.4	1,671	17.0	3,079	31.2	264	2.7	5,059	51.3
			Subtotal	44	0.4	2,947	29.9	5,983	60.7	880	8.9	9,854	100.0
7/14	221	178	M	0	0.0	1,193	12.9	2,231	24.2	415	4.5	3,840	41.6
7/13-7/18			F	0	0.0	2,491	27.0	2,439	26.4	467	5.1	5,397	58.4
			Subtotal	0	0.0	3,684	39.9	4,670	50.6	882	9.6	9,237	100.0
7/22-7/25	210	180	M	0	0.0	1,206	18.3	1,571	23.9	183	2.8	2,960	45.0
(7/19-7/25)			F	0	0.0	1,718	26.1	1,791	27.2	109	1.6	3,618	55.0
			Subtotal	0	0.0	2,924	44.4	3,362	51.1	292	4.4	6,578	100.0
7/27	210	163	M	0	0.0	1,838	21.5	1,943	22.7	158	1.8	3,938	46.0
(7/26-7/31)			F	53	0.6	1,995	23.3	2,573	30.1	0	0.0	4,621	54.0
			Subtotal	53	0.6	3,833	44.8	4,516	52.8	158	1.8	8,559	100.0
8/4 8/5	210	179	M	0	0.0	581	7.3	268	3.4	89	1.1	939	11.7
(8/1-8/8)			F	0	0.0	4,381	54.7	2,459	30.7	224	2.8	7,062	88.3
			Subtotal	0	0.0	4,962	62.0	2,727	34.1	313	3.9	8,001	100.0
8/11, 8/12,	379	319	M	15	0.6	403	16.3	263	10.7	46	1.9	728	29.5
8/15, 8/18-8/22			F	31	1.3	1,277	51.7	418	16.9	16	0.6	1,742	70.5
(8/9-9/15)			Subtotal	46	1.9	1,680	68.0	681	27.6	62	2.5	2,470	100.0
Season	1,494	1,243	M	16	0.0	6,497	14.5	9,181	20.5	1,507	3.4	17,200	38.5
			F	127	0.3	13,533	30.3	12,758	28.6	1,080	2.4	27,499	61.5
			Total	143	0.3	20,030	44.8	21,939	49.1	2,587	5.8	44,699	100.0
Grand		9,401	M	1,458	0.4	111,873	29.1	69,202	18.0	2,783	0.7	185,312	48.2
Total [a]			F	2,901	0.8	129,563	33.7	65,168	16.9	1,691	0.4	199,326	51.8
			Total	4,359	1.1	241,436	62.8	134,369	34.9	4,474	1.2	384,638	100.0

Note: The numbers of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors. The numbers of fish in "Season" are the strata sums; "Season" percentages are derived from the sums.

[a] The number of fish in the "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1990 through 1991, 1997 through 1999, and 2001 through 2008.

Table 12.–Mean length (mm) of chum salmon escapement through the Middle Fork Goodnews River weir, 2008.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
7/6-7/10 (6/26-7/12)	M	Mean Length		596	609	636
		Std. Error		4	4	7
		Range		550-645	540-696	599-692
		Sample Size	0	29	66	14
	F	Mean Length	513	559	574	583
		Std. Error	-	5	3	9
		Range	513-513	439-610	490-615	549-607
		Sample Size	1	38	70	6
7/14 7/13-7/18	M	Mean Length		598	612	601
		Std. Error		5	5	8
		Range		552-642	537-692	559-634
		Sample Size	0	23	43	8
	F	Mean Length		559	575	584
		Std. Error		3	4	6
		Range		517-610	515-634	540-599
		Sample Size	0	48	47	9
7/22-7/25 (7/19-7/25)	M	Mean Length		593	611	604
		Std. Error		5	6	13
		Range		532-654	503-691	569-637
		Sample Size	0	33	43	5
	F	Mean Length		559	573	554
		Std. Error		3	4	27
		Range		518-600	519-633	500-581
		Sample Size	0	47	49	3
7/27 (7/26-7/31)	M	Mean Length		599	608	586
		Std. Error		4	5	23
		Range		553-643	526-652	554-631
		Sample Size	0	35	37	3
	F	Mean Length	507	571	582	
		Std. Error	-	4	4	
		Range	507-507	492-626	537-641	
		Sample Size	1	38	49	0
8/4 8/5 (8/1-8/8)	M	Mean Length		558	581	572
		Std. Error		11	8	34
		Range		510-650	553-600	538-605
		Sample Size	0	13	6	2
	F	Mean Length		554	556	567
		Std. Error		2	3	8
		Range		501-612	503-613	537-584
		Sample Size	0	98	55	5

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Table 12.–Page 2 of 2.

Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
8/11-22 (8/9-9/15)	M	Mean Length	582	577	575	578
		Std. Error	10	4	5	12
		Range	572-592	498-634	529-643	522-606
		Sample Size	2	52	34	6
	F	Mean Length	508	541	542	531
		Std. Error	9	2	4	4
		Range	485-524	465-627	469-603	527-534
		Sample Size	4	165	54	2
Season	M	Mean Length	582	592	608	612
		Range	572-592	498-654	503-696	522-692
		Sample Size	2	185	229	38
	F	Mean Length	509	558	571	577
		Range	485-524	439-627	469-641	500-607
		Sample Size	6	434	324	25
Grand Total [a]	M	Mean Length	556	589	611	624
		Range	495-592	480-685	503-710	522-692
		Sample Size	47	2,575	1,639	71
	F	Mean Length	531	557	574	580
		Range	485-560	475-640	469-675	500-645
		Sample Size	102	3,159	1569	36

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1990 through 1991, 1997 through 1999, and 2001–2008.

Table 13.–Age and sex composition of coho salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (Stratum)	Pulse Sample Size	Aged Sample Size	Sex	Age Class 1.1 Esc.	1.1 %	2.1 Esc.	2.1 %	3.1 Esc.	3.1 %	Total Esc.	Total %
7/26-8/20	218	146	M	77	2.1	2,191	58.2	77	2.1	2,346	62.3
(7/2-8/23)			F	103	2.7	1,186	31.5	129	3.4	1,418	37.7
			Subtotal	180	4.8	3,377	89.7	206	5.5	3,764	100.0
8/26, 8/27	170	132	M	306	4.6	2,394	35.6	204	3.0	2,904	43.2
(8/24-8/30)			F	458	6.8	3,210	47.7	153	2.3	3,821	56.8
			Subtotal	764	11.4	5,604	83.3	357	5.3	6,725	100.0
9/3	170	126	M	608	5.5	3,651	33.3	521	4.7	4,781	43.7
(8/31-9/6)			F	435	4.0	5,563	50.8	174	1.6	6,172	56.3
			Subtotal	1,043	9.5	9,214	84.1	695	6.3	10,953	100.0
9/10, 9/15	237	175	M	868	5.7	6,162	40.6	173	1.2	7,203	47.4
(9/7-9/18)			F	521	3.4	6,943	45.7	521	3.4	7,985	52.6
			Subtotal	1,389	9.1	13,105	86.3	694	4.6	15,188	100.0
Season	795	579	M	1,859	5.1	14,399	39.3	976	2.6	17,235	47.1
			F	1,517	4.1	16,902	46.2	977	2.7	19,395	52.9
			Subtotal	3,376	9.2	31,301	85.5	1,953	5.3	36,630	100.0
Grand Total [a]		4,384	M	13,244	4.5	127,437	43.1	6,226	2.1	146,907	50.8
			F	10,886	3.7	131,075	44.4	6,510	2.2	148,470	49.2
			Total	24,130	8.2	258,332	87.5	12,736	4.3	295,377	100.0

Note: The number of fish in each stratum category are derived from sample percentages; sum discrepancies are attributed to rounding errors.

[a] The number of fish in "Grand total" are the sum of historical "Season" totals; percentages are derived from those sums. Years included are 1998–2004, and 2006-2008.

Table 14.–Mean length (mm) of coho salmon escapement, Middle Fork Goodnews River weir, 2008.

Sample Dates (stratum Dates)	Sex		Age Class 1.1	2.1	3.1
7/26-8/20	M	Mean Length	507	562	525
(7/2-8/23)		Std. Error	24	5	21
		Range	464-545	475-658	490-564
		Sample Size	3	85	3
	F	Mean Length	593	584	552
		Std. Error	9	4	22
		Range	576-619	508-645	480-599
		Sample Size	4	46	5
8/26 8/27	M	Mean Length	548	571	576
(8/24-8/30)		Std. Error	18	7	15
		Range	500-600	375-650	555-619
		Sample Size	6	47	4
	F	Mean Length	574	583	550
		Std. Error	7	4	11
		Range	544-610	463-646	528-562
		Sample Size	9	63	3
9/3	M	Mean Length	563	592	606
(8/31-9/6)		Std. Error	9	5	8
		Range	537-598	500-652	576-633
		Sample Size	7	42	6
	F	Mean Length	565	590	570
		Std. Error	13	3	26
		Range	519-590	526-641	544-595
		Sample Size	5	64	2
9/10 9/15	M	Mean Length	565	586	638
(9/7-9/18)		Std. Error	8	4	12
		Range	525-604	505-673	626-650
		Sample Size	10	71	2
	F	Mean Length	585	588	597
		Std. Error	6	3	6
		Range	564-600	517-636	578-609
		Sample Size	6	80	6
Season	M	Mean Length	559	581	599
		Range	464-604	375-673	490-650
		Sample Size	26	245	15
	F	Mean Length	576	587	579
		Range	519-619	463-646	480-609
		Sample Size	24	253	16

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Table 14.–Page 2 of 2.

Sample Dates (stratum Dates)	Sex		Age Class 1.1	2.1	3.1
Grand Total [a]	M	Mean Length	555	579	582
		Range	455-658	405-707	360-675
		Sample Size	171	1,881	134
	F	Mean Length	584	586	584
		Range	497-677	400-680	420-625
		Sample Size	117	1,765	166

[a] "Grand Total" mean lengths are simple averages of historical "Season" mean lengths. Years included are 1998–2004, and 2006-2008.

Table 15.–Daily weather and hydrological observations, Middle Fork Goodnews River weir site, 2008.

Date	Permits	Chinook		Sockeye		Chum		Coho	
Caught	Fished	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds	Harvest	Pounds
19 Jun	18	170	2,271	873	6,090	399	3,090	0	0
24 Jun	18	310	3,914	1,368	9,570	1,337	10,198	0	0
26 Jun	19	290	4,132	2,533	17,587	1,762	13,459	0	0
1 Jul	20	115	1,740	2,490	17,774	1,716	12,760	0	0
5 Jul	20	52	789	2,314	16,587	101	862	0	0
8 Jul	19	67	1,245	2,362	16,881	221	1,668	0	0
10 Jul	16	39	678	1,809	12,592	290	2,149	0	0
12 Jul	0	0	0	0	0	0	0	0	0
14 Jul	21	60	1,073	3,070	21,140	1,277	9,443	0	0
16 Jul	16	39	729	1,609	11,303	374	2,901	0	0
18 Jul	0	0	0	0	0	0	0	0	0
21 Jul	19	30	531	1,971	13,641	785	5,610	27	187
23 Jul	18	22	301	1,610	11,161	625	4,505	57	402
25 Jul	15	10	170	870	5,970	431	3,152	69	507
28 Jul	16	15	321	872	6,129	352	2,416	235	1,595
30 Jul	12	8	133	724	5,021	247	1,647	281	1,928
1 Aug	14	12	210	570	3,885	150	1,030	386	2,773
4 Aug	16	6	110	513	3,426	68	501	392	2,942
6 Aug	13	5	72	242	1,664	36	257	452	3,285
8 Aug	12	3	39	311	2,061	27	185	426	3,238
10 Aug	13	7	107	307	2,017	21	127	1,050	7,880
12 Aug	14	3	53	159	1,023	29	186	1,582	12,253
14 Aug	16	7	82	144	935	14	87	2,009	16,034
16 Aug	15	6	97	108	723	12	85	3,203	25,879
18 Aug	17	1	11	134	976	27	195	3,102	26,010
20 Aug	16	0	0	68	448	6	42	2,271	19,414
22 Aug	15	3	26	66	470	6	37	2,027	17,088
25 Aug	13	0	0	55	359	13	91	1161	9510
27 Aug	12	0	0	27	194	7	47	2,648	23,313
29 Aug	14	1	8	57	405	7	51	1,169	10,077
Total	25	1,281	18,842	27,236	190,032	10,340	76,781	22,547	184,315
Avg. Wt.		14.7		7.0		7.4		8.2	
Avg. Price		$0.70		$0.55		$0.05		$0.42	
Total Exvessel Value		$13,189		$104,518		$3,839		$77,412	

Total Fish	61,404
Total Pounds	469,970
Total Exvessel Value	$198,958

Table 16.–Daily weather and hydrological observations, Middle Fork Goodnews River weir.

Date	Wind (Dir./Speed)	Precipitation mm/24hr	Air Temp. °C	Water Temp °C	Cloud Cover %/altitude	Water Level (cm)
6/22	W/4	0.0	8	9	FOG	50
6/23	E/10	0.0	14	9	100/2,000	46
6/24	E/5	0.0	14	8	100/1,500	44
6/25	E/30	0.0	11	8	100/2,000	43
6/26	E/5	0.0	15	8	100/3,000	42
6/27	SW/5	3.0	13	10	50/1,500	40
6/28	SSW/15	28.0	15	10	75/500	39
6/29	W/15	0.0	8	10	75/1,500	39
6/30	S/15	0.0	14	11	50/1,500	36
7/01	SE/20	0.0	16	9	100/2,000	35
7/02	SSE/30	0.0	12	9	100/1,200	37
7/03	0	2.0	13	8	100/2,500	36
7/04	SE/5	1.0	14	9	100/1,200	36
7/05	W/15	0.0	24	10	70/2,500	34
7/06	W/20	5.0	20	14	30/2,500	32
7/07	E/15	0.0	22	13	30/2,000	32
7/08	S/20	5.0	13	11	90/	30
7/09	W/10	2.0	9	12	100/600	29
7/10	SW/10	5.0	12	11	100/900	28
7/11	E/10	44.0	8	10	11/400	28
7/12	0	64.0	17	12	0	35
7/13	0	0.0	8	11	10/300	35
7/14	S/15	0.0	15	12	50/2,000	30
7/15	S/15	46.0	11	11	100/500	32
7/16	SE/10	60.0	10	9	100/400	41
7/17	W/20	50.0	9	9	100/500	53
7/18	0	50.0	7	8	100/400	58
7/19	W/5	3.0	15	9	50/1,200	60
7/20	0	0.0	8	9	100/800	56
7/21	W/5	15.0	15	10	95/2,100	55
7/22	SW/17	5.0	9	9	100/800	52
7/23	W/5	3.0	11	10	90/100	50
7/24	N/15	17.0	17	12	5/2,500	50
7/25	W/5	0.0	14	10	30/2,500	44
7/26	W/5	0.0	12	11	80/2,000	42
7/27	E/10	0.0	15	10	50/2,000	39
7/28	0	0.0	13	11	0	36
7/29	N/20	0.0	18	13	50/3,500	36
7/30	0	0.0	12	10	30/3,000	33
7/31	NW/5	0.0	12	11	10/3,000	31
8/01	E/5	0.0	13	12	40/3,000	31
8/02	W/5	0.0	13	12	80/1,000	29
8/03	W/10	0.0	17	12	40/3,500	26
8/04	W/5	0.0	21	12	40/3,000	24
8/05	0	0.0	12	12	0	24
8/06	0	0.0	15	12	30/3,000	23
8/07	W/10	0.0	18	14	10/3,500	19

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Table 16.–Page 2 of 2.

Date	Wind (Dir./Speed)	Precipitation mm/24hr	Air Temp. °C	Water Temp °C	Cloud Cover %/altitude	Water Level (cm)
8/08	W/5	0.0	19	12	80/2,500	20
8/09	W/5	0.0	13	12	20/3,000	19
8/10	E/5	0.0	21	13	60/3,000	17
8/11	0	10.0	14	12	20/3,000	19
8/12	E/20	0.0	18	15	20/2,000	18
8/13	NW/5	0.0	16	14	80/2,000	18
8/14	W/10	17.0	N/A	13	50/1,500	21
8/15	W/5	3.0	14	12	100/1,000	23
8/16	W/5	1.0	13	12	100/1,000	19
8/17	E/5	10.0	18	12	90/1,000	16
8/18	W/5	7.0	13.5	12.5	50/1,500	16
8/19	W/10	6.5	17	13	90/1,000	15
8/20	S/10	11.0	13.5	12.5	100/1,000	15
8/21	S/10	0.0	13.5	12	90/1,000	15
8/22	S/5	4.0	13	12	90/1,500	16
8/23	NW/15	1.0	19	13	10/1,500	19
8/24	NW/10	0.0	18.5	13	10/1,500	15
8/25	SW/10	0.0	18	12	40/3,000	14
8/26	0	0.0	11	11	100/900	12
8/27	W/5	19.0	11	11	100/1,500	12
8/28	W/5	42.0	11	11	15/2,500	15
8/29	S/5	4.0	9.5	10	100/500	15
8/30	E/5	13.0	12	10	100/500	14
8/31	NE/5	19.0	13	10	100/1,700	15
9/01	NE/10	6.0	17.5	11	95/2,000	16
9/02	0	33.0	10	10	75/1,500	15
9/03	S/15	11.0	13	10	80/500	17
9/04	E/5	12.0	12	11	100/200	15
9/05	E/5	42.0	12	10	100/1,000	15
9/06	N/10	2.0	10	9	100/1,500	13
9/07	NE/5	12.0	11.5	10	100/400	13
9/08	NE/5	33.0	9	9	100/	16
9/09	0	11.0	13.5	10	100/2,400	15
9/10	W/20	5.0	13.5	11	50/2,400	15
9/11	NE/15	0.0	13.5	11	90/2,000	15
9/12	NE/10	29.0	14	10	100/2,000	15
9/13	N/5	48.0	12	10	100/2,000	27
9/14	E/10	71.0	11	9	100/	43
9/15	E/10	3.0	13	10	95/2,400	45
9/16	E/5	17.0	9.5	9	100/500	41
9/17	0	21.0	5.5	9	100/2,500	38

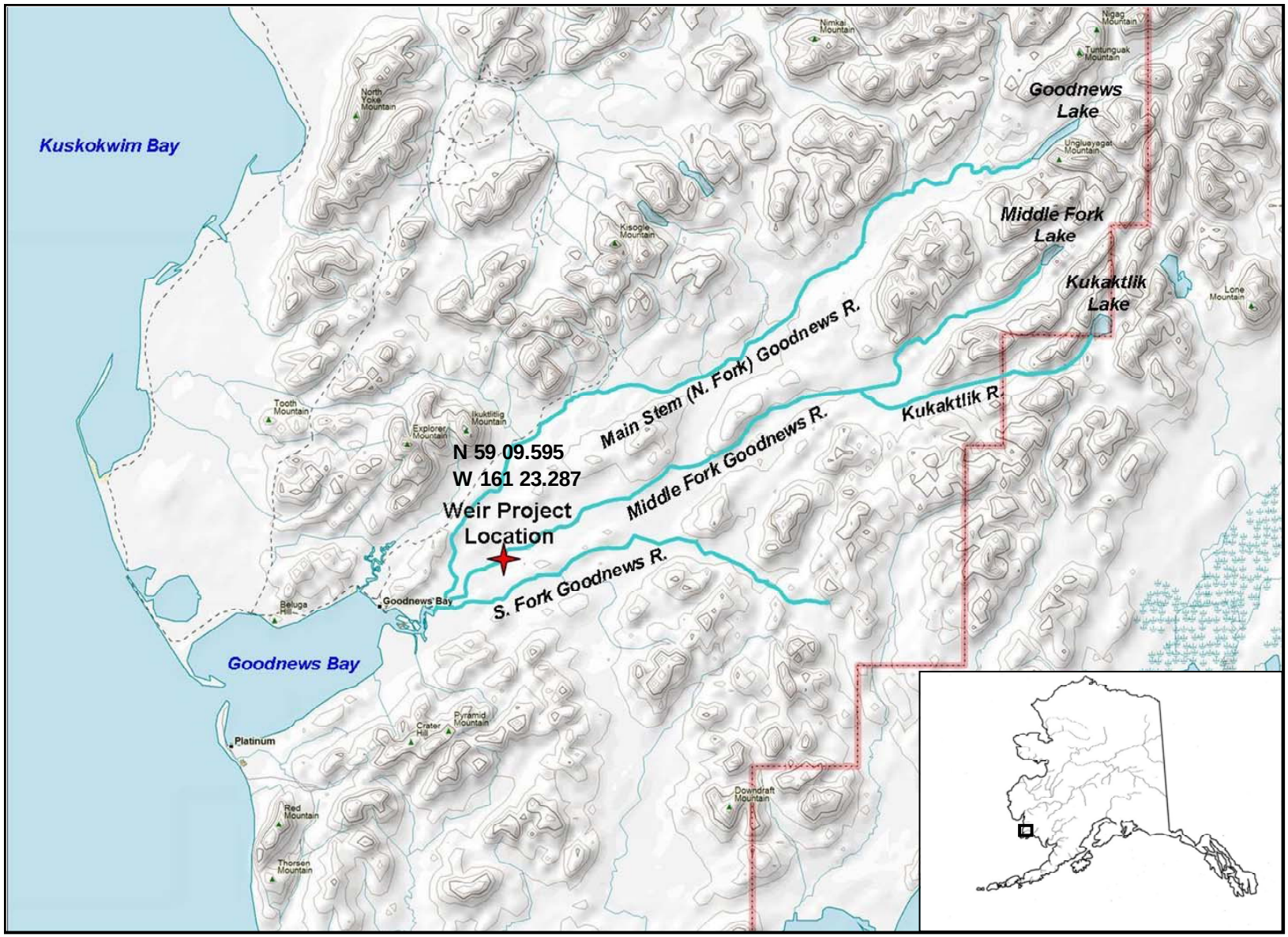

Figure 1.–Goodnews River drainage, Kuskokwim Bay, Alaska.

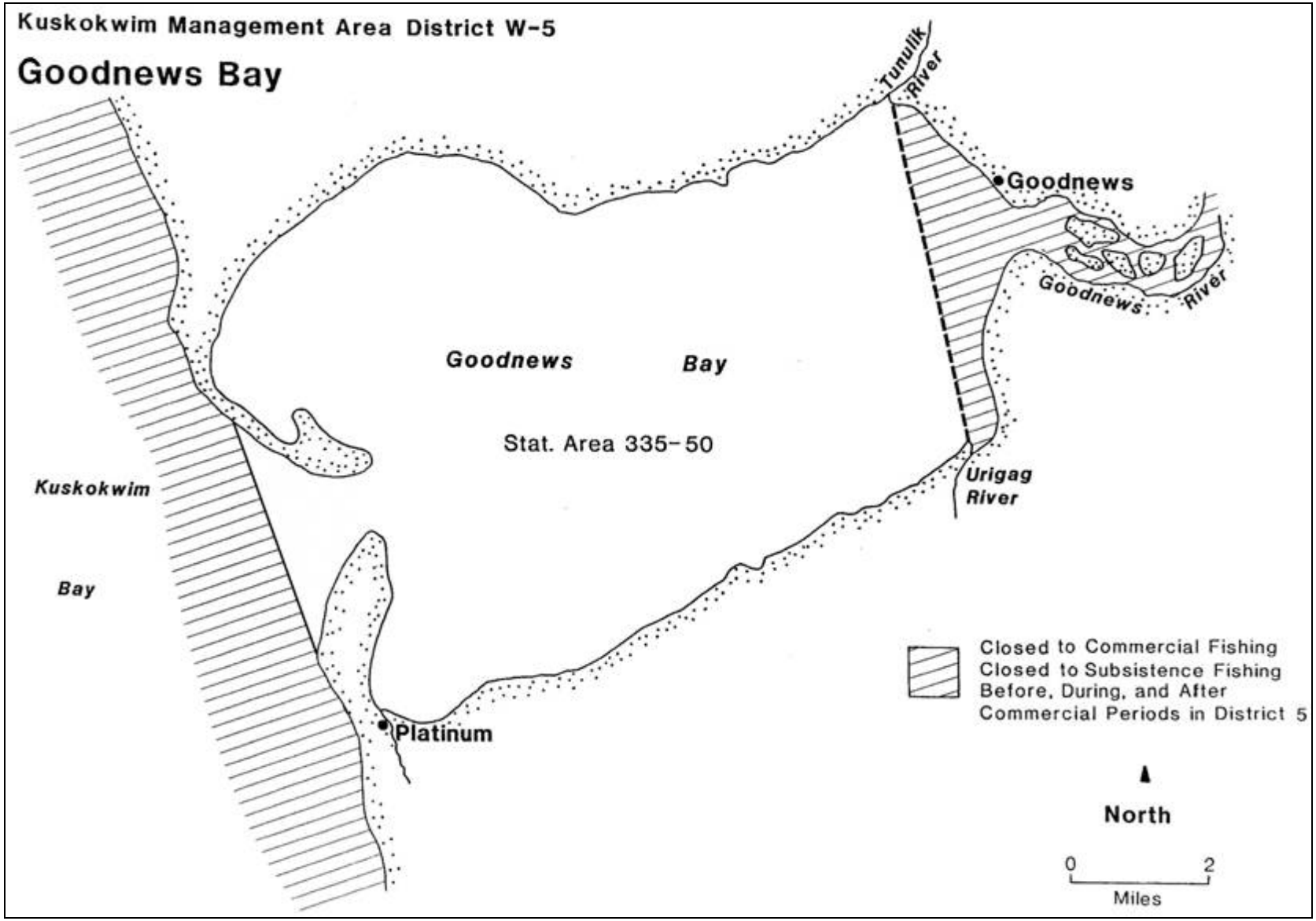

Figure 2.–Commercial fishing District W-5 (Goodnews Bay), Kuskokwim Bay, Alaska, 2008.

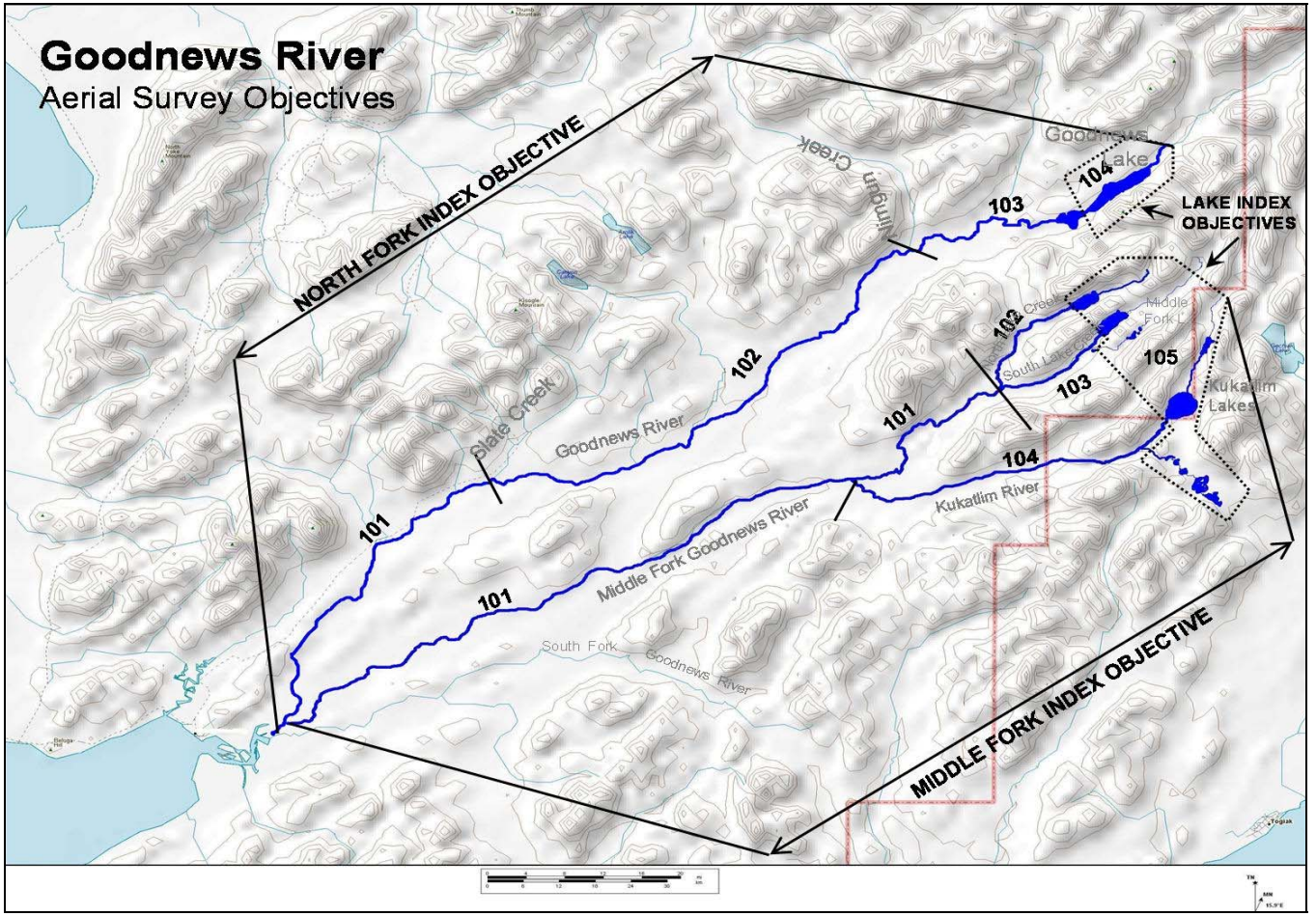

Figure 3.–Map of index areas used for aerial surveys on the Goodnews River drainage.

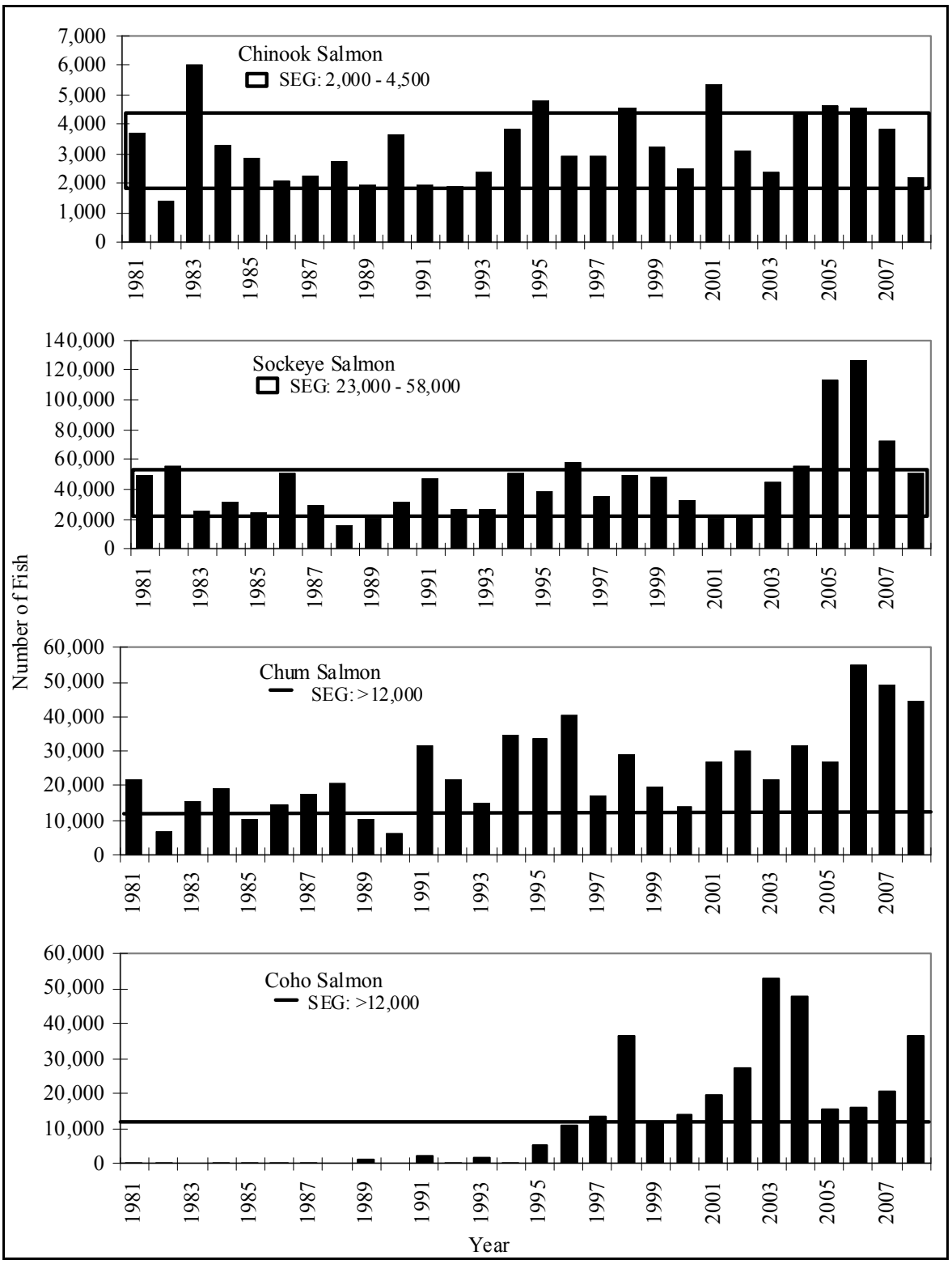

Figure 4.–Historical Chinook, sockeye, chum, and coho salmon escapement estimates, Middle Fork Goodnews River weir, 1981–2008.

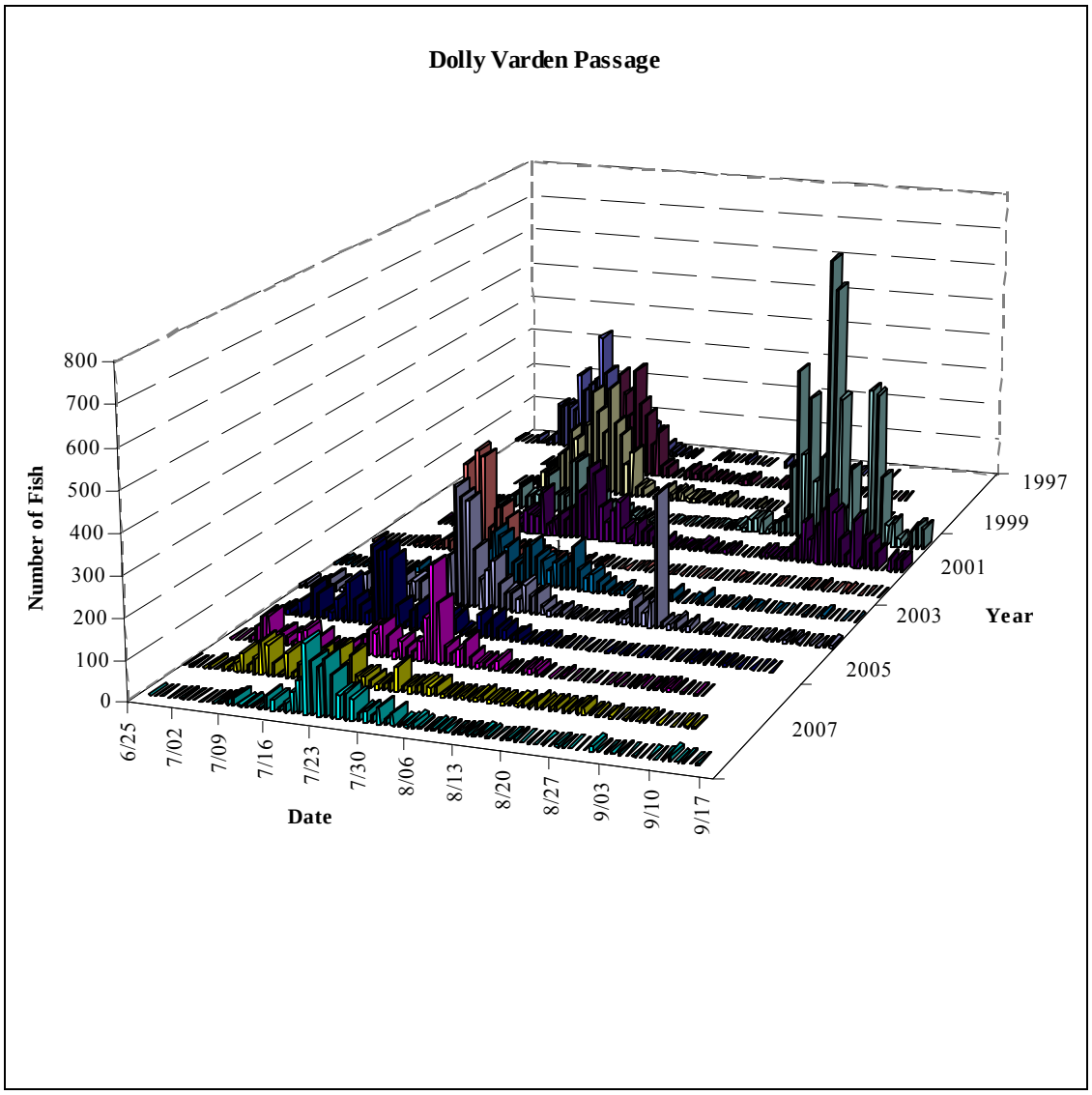

Figure 5.–Historical daily Dolly Varden passage, Middle Fork Goodnews River weir.

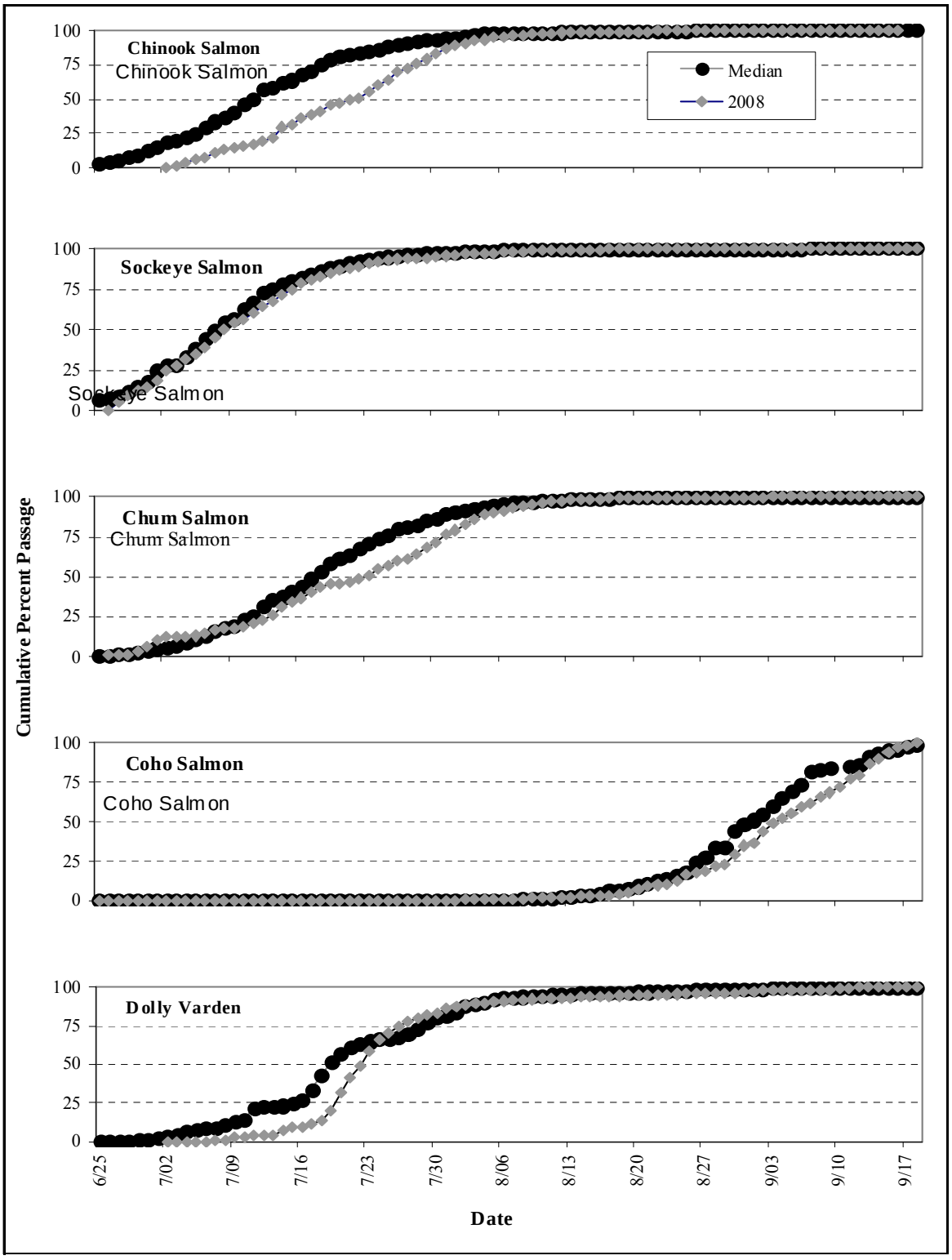

Figure 6.–Cumulative percent passage of Chinook, sockeye, chum, and coho salmon and Dolly Varden, 2008 and historical median, Middle Fork Goodnews River weir.

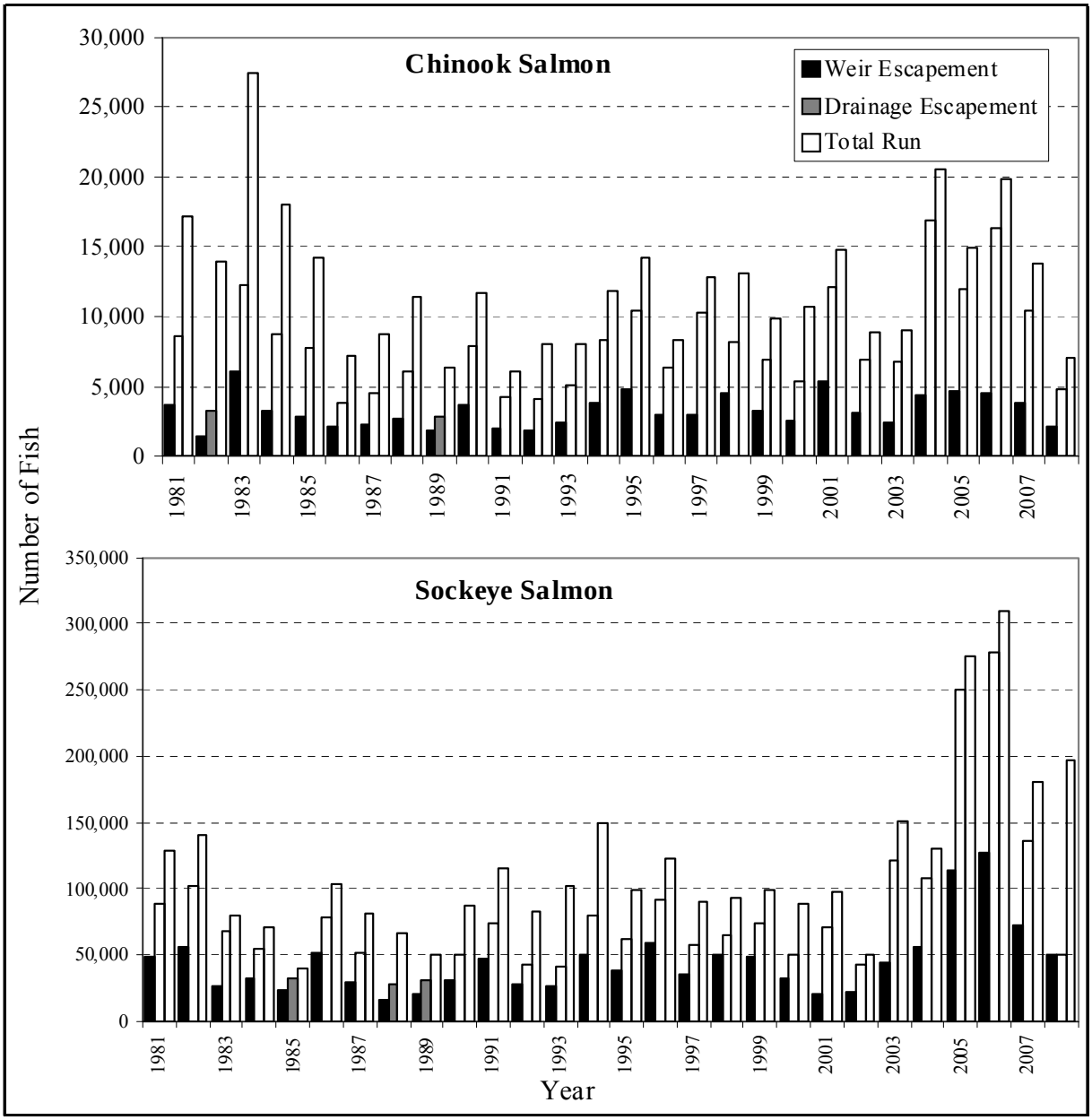

Figure 7.–Historical Chinook and sockeye salmon escapement estimates and total run, Middle Fork Goodnews River weir and Goodnews River drainage. 1981–2008.

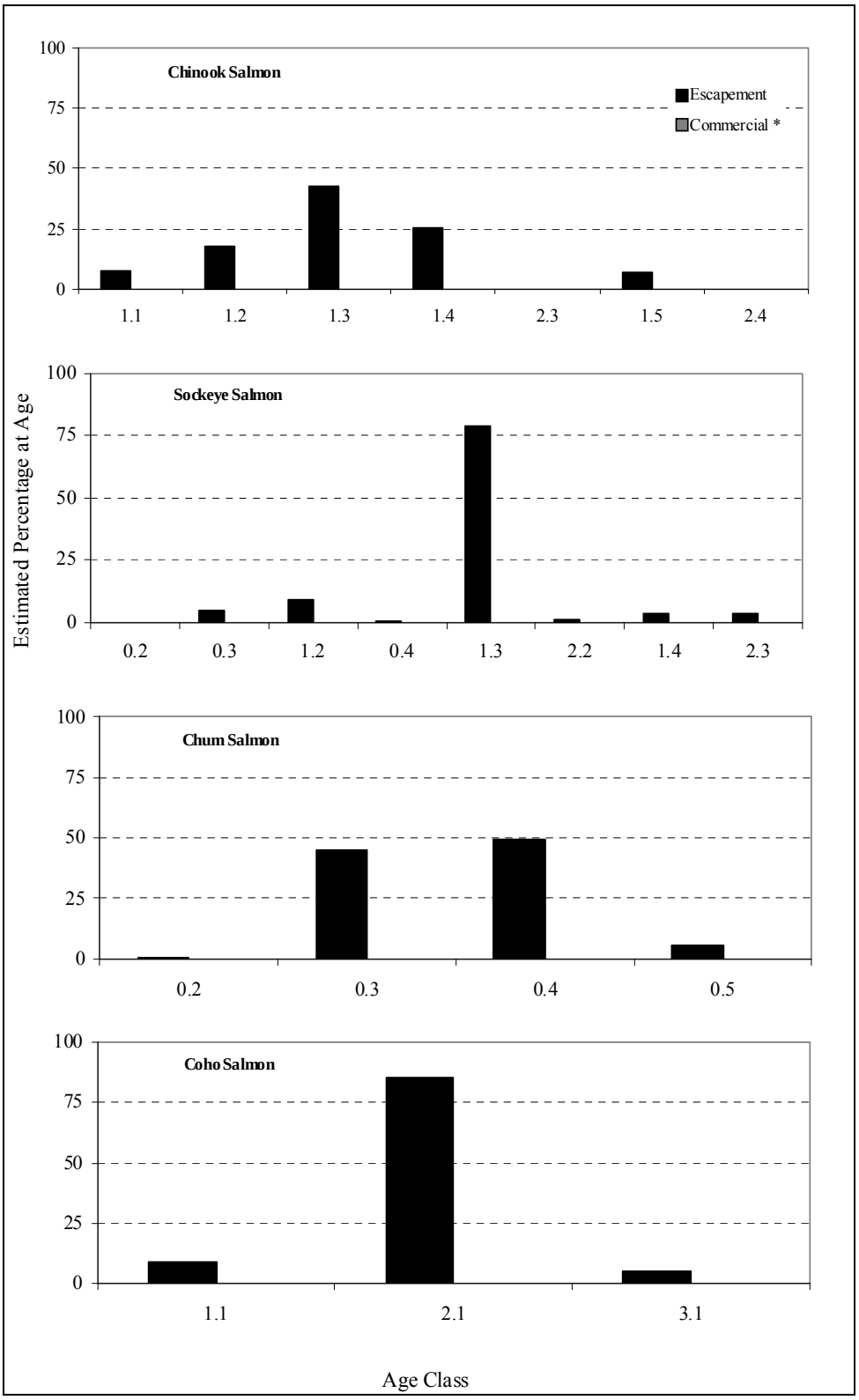

Figure 8.–Estimated age class percentages for Chinook, sockeye, chum, and coho salmon from Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2008.

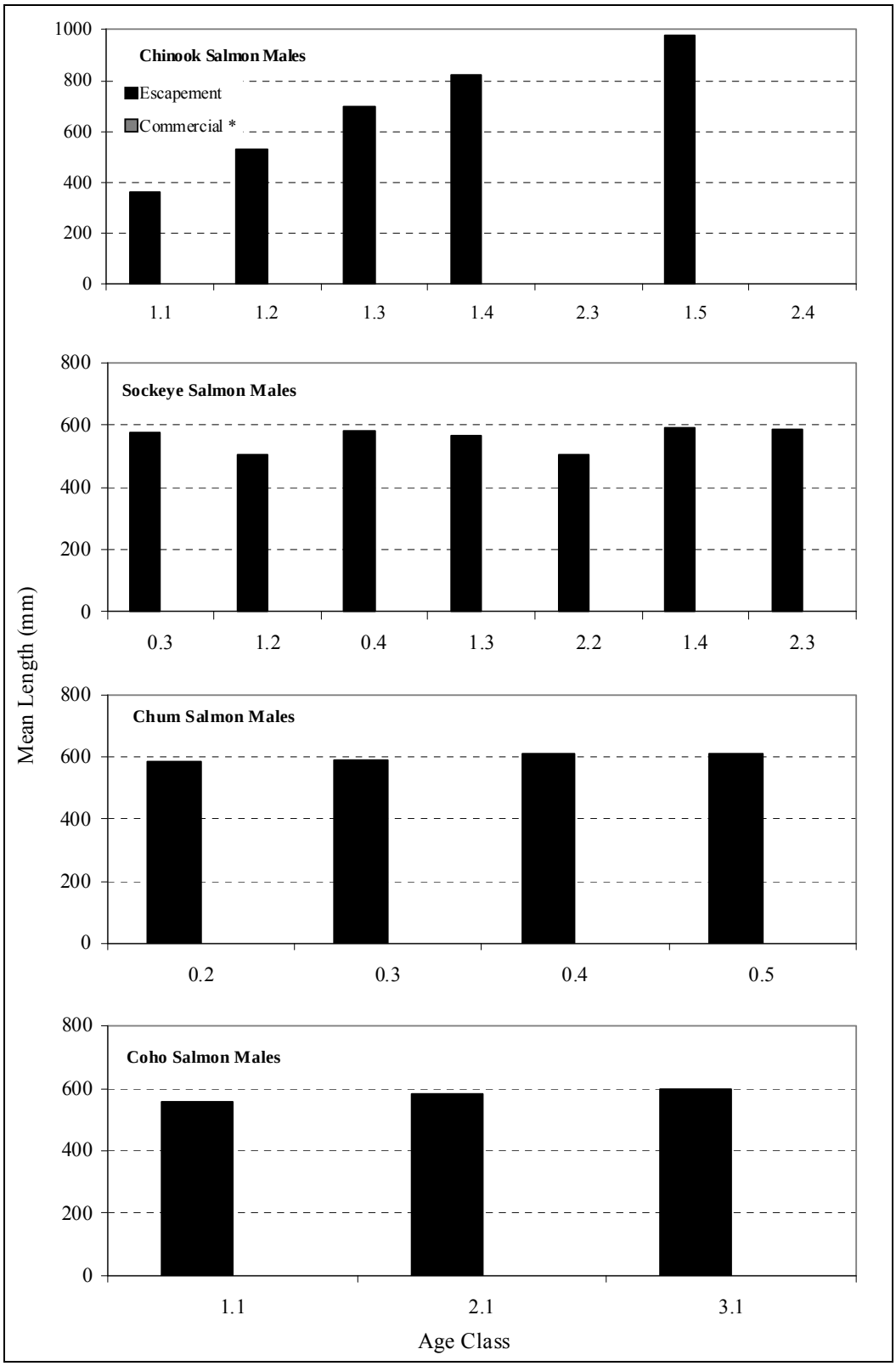

Figure 9.–Mean length by age class for male Chinook, sockeye, chum, and coho salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2008.

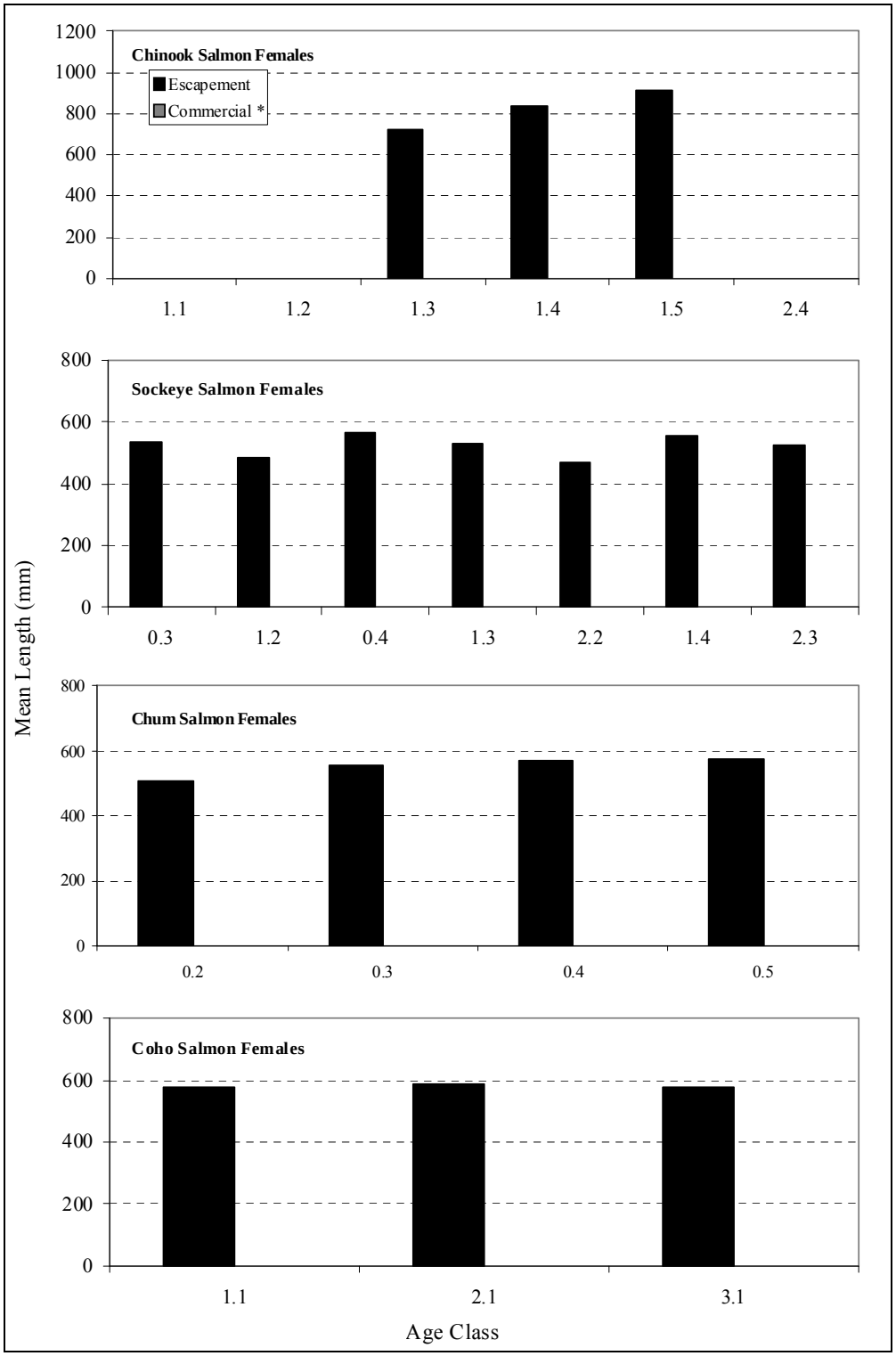

Figure 10.–Mean length by age class for female Chinook, sockeye, chum, and coho salmon, Middle Fork Goodnews River weir escapement and District W-5 commercial harvest, 2008.

APPENDIX A. SALMON HARVESTS OF GOODNEWS BAY AREA

Appendix A1.–Historical commercial, subsistence, and sport fishing harvest of Chinook, sockeye, coho, and chum salmon, Goodnews Bay area, 1968–2008.

	Chinook			Sockeye			Chum			Coho		
Year	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
1968										5,458		
1969	3,978			6,256			5,006			11,631		
1970	7,163			7,144			12,346			6,794		
1971	477			330			301			1,771		
1972	264			924			1,331			925		
1973	3,543			2,072			15,781			5,017		
1974	3,302			9,357			8,942			21,340		
1975	2,156			9,098			5,904			17,889		
1976	4,417			5,575			10,354			9,852		
1977	3,336	574[a]		3,723			6,531			13,335		
1978	5,218			5,412			8,590			13,764		
1979	3,204	338		19,581			9,298			42,098		
1980	2,331	690		28,632			11,748			43,256		
1981	7,190	1,409		40,273			13,642			19,749		
1982	9,476	1,236		38,877			13,829			46,683		
1983	14,117	1,066	31	11,716		14	6,766		10	19,660		168
1984	8,612	629		15,474			14,340			71,176		
1985	5,793	426	323	6,698	704	75	4,784	348	124	16,498	221	386
1986	2,723	555		25,112	943	122	10,355	191		19,378	8[b]	
1987	3,357	816		27,758	955	266	20,381	578		29,057	43[b]	
1988	4,964	310		36,368	1,065		33,059	448		30,832	1,162	
1989	2,966	468	68	19,299	861	146	13,622	784	0	31,849	907	224
1990	3,303	539		35,823	1,123		13,194	332		7,804	1,646	
1991	912	917	26	39,838	1,282	63	15,892	149	189	13,312	1,828	297
1992	3,528	374	23	39,194	826	8	18,520	1,006	0	19,875	1,353	138
1993	2,117	708	81	59,293	836	53	10,657	188	156	20,014	1,226	189
1994	2,570	784	163	69,490	770	70	28,477	470	15	47,499	512	170
1995	2,922	883	41	37,351	253	34	19,832	156	0	17,875	305	114
1996	1,375	415	157	30,717	418	87	11,093	219	0	43,836	352	466
1997	2,039	449	86	31,451	609	61	11,729	133	24	2,983	397	855
1998	3,675	718	431	27,161	508	502	14,155	316	50	21,246	331	574
1999	1,888	871	223	22,910	872	561	11,562	281	47	2,474	582	789

-continued-

Appendix A1.–Page 2 of 2.

Year	Chinook			Sockeye			Chum			Coho		
	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
2000	4,442	703	243	37,252	1,205	82	7,450	364	12	15,531	517	795
2001	1,519	895	147	25,654	974	108	3,412	226	21	9,275	616	822
2002	979	857	224	6,304	1,050	149	3,799	407	99	3,041	297	429
2003	1,412	737	10	29,423	783	42	5,593	176	14	12,658	1,319	681
2004	2,565	954	100	20,922	960	0	6,014	257	0	23,690	1,617	622
2005	2,035	868	0	23,933	1,233	0	2,568	209	0	11,735	839	1,046
2006	2,892	676	754	29,857	1,007	523	11,568	648	145	12,436	704	1,742
2007	3,112	24	177	43,716	20	84	7,519	7	0	13,689	36	211
2008	1,281	[c]	[c]	27,236	[c]		c 10,340	[c]	[c]	22,547	[c]	[c]
10-Year Average [d]	2,452	730	231	26,713	861	205	7,364	289	39	12,578	686	771
Historical Average [e]	2,561	657	164	33,298	833	143	12,486	339	43	18,083	827	565

Note: Commercial harvest from District W-5, combined subsistence harvest by the communities of Goodnews Bay and Platinum, subsistence harvest estimates prior to 1988 are based on a different formula and are not comparable with estimates from 1988 to present.

[a] Subsistence harvest estimate in 1977 was for Goodnews Bay only.

[b] Subsistence harvest estimates are for the community of Platinum only.

[c] Not available at time of publication.

[d] Ten year average ranging from 1998–2007.

[e] Historical average of harvest from 1988–2007.

APPENDIX B. GOODNEWS ESCAPEMENT

Appendix B1.–Historical escapement, Middle Fork Goodnews River escapement projects, 1981–2008.

Year	Method	Dates of Operation	Chinook	Sockeye	Chum	Pink[a]	Coho	Dolly Varden
1981	Counting Tower[b]	6/13 - 8/9	3,688	49,108	21,827	[e]	356 [d]	[e]
1982	Counting Tower[b]	6/23 - 8/3	1,395	56,255	6,767	[e]	91 [d]	[e]
1983	Counting Tower[b]	6/11 - 7/28	6,027	25,816	15,548	[e]	0 [d]	[e]
1984	Counting Tower[b]	6/15 - 7/31	3,260	32,053	19,003	[e]	249 [d]	[e]
1985	Counting Tower[b]	6/27 - 7/31	2,831	24,131	10,367	[e]	282 [d]	[e]
1986	Counting Tower[b]	6/16 - 7/24	2,080	51,069	14,764	[e]	163 [d]	[e]
1987	Counting Tower[b]	6/22 - 7/30	2,272	28,871	17,517	[e]	62 [d]	[e]
1988	Counting Tower[b]	6/23 - 7/30	2,712	15,799	20,799	[e]	6 [d]	[e]
1989	Counting Tower[b]	6/27 - 7/31	1,915	21,186	10,380	[e]	1,212 [d]	[e]
1990	Counting Tower[b]	6/20 - 7/31	3,636	31,679	6,410	[e]	0 [d]	[e]
1991	Fixed Picket Weir[c]	6/29 - 8/23	1,952	47,397	31,644	1,428	1,978 [d]	[e]
1992	Fixed Picket Weir[c]	6/21 - 8/4	1,905	27,268	22,023	22,601	150 [d]	[e]
1993	Fixed Picket Weir[c]	6/23 - 8/18	2,349	26,452	14,952	318	1,451 [d]	[e]
1994	Fixed Picket Weir[c]	6/23 - 8/9	3,856	50,801	34,849	38,705	309 [d]	[e]
1995	Fixed Picket Weir[c]	6/19 - 8/28	4,836	39,009	33,699	330	5,415 [d]	[e]
1996	Fixed Picket Weir[c]	6/19 - 8/23	2,931	58,290	40,450	20,105	10,869 [d]	1,829 [d]
1997	Fixed/R. Board Weir	6/12 - 9/17	2,937	35,530	17,369	940	13,413	2,808
1998	R. Board Weir	7/4 - 9/17	4,584 [d]	49,513 [d]	28,832 [d]	10,376	36,596	2,915
1999	R. Board Weir	6/25 - 9/26	3,221	48,205	19,513	914	11,545	1,761
2000	R. Board Weir	7/2 - 8/27	2,500 [d]	32,341 [d]	13,791 [d]	0	13,907	6,616
2001	R. Board Weir	6/26 - 9/30	5,351	21,024	26,820	5,405	19,626	3,535
2002	R. Board Weir	6/25 - 9/18	3,085	22,101	30,300	0	27,364	1,770
2003	R. Board Weir	6/18 - 9/18	2,389	44,387	21,637	1,921	52,810	1,949
2004	R. Board Weir	6/21 - 9/20	4,388	55,926	31,616	21,633	47,917	3,492
2005	R. Board Weir	6/26 - 9/8	4,633	113,809	26,690	5,926	15,683	2,128
2006	R. Board Weir	6/26 - 9/7	4,559	126,772	54,699	18,432	15,969	1,858
2007	R. Board Weir	6/25 - 9/10	3,852	72,282	49,285	4,819	20,767	1,549
2008	R. Board Weir	7/02-9/15	2,161	50,459	44,699	9,807	36,630	1,416
10-year average (1998-2007)			3,856	58,636	30,318	6,943	26,218 [f]	2,757
Historical Average			3,287	44,537	23,836	9,050	11,455 [f]	2,684

[a] Picket spacing of the weir panels allows pink salmon to freely pass through the weir unobserved.

[b] Project located approximately 500 yd upriver from the current weir location.

[c] Species not enumerated during project operations.

[d] No counts or incomplete counts as the project was not operational during a large portion of species migration. These years not included in the historical average.

[e] Fixed picket weir operated in the same location as the current weir.

[f] Average (1997–2005). Coho operations started in 1997.

APPENDIX C. GOODNEWS AERIAL SURVEYS

Appendix C1.–Historical aerial survey counts by species, Goodnews River drainage, 1980–2008.

	North Fork Goodnews River and Lakes				Middle Fork Goodnews River and Lakes			
Year	Chinook	Sockeye	Chum	Coho	Chinook	Sockeye	Chum	Coho
1980	[a]	[a]	[a]	[a]	[a]	18,926	[a]	[a]
1981	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1982	1,990	19,160	9,700	[a]	1,546	[a]	6,300	[a]
1983	2,600	9,650	[a]	[a]	2,500	5,900	[a]	[a]
1984	3,245	9,240	17,250	[a]	1,930	12,897	9,172	[a]
1985	3,535	2,580	4,415	[a]	2,050	7,211	3,593	[a]
1986	1,068	8,960	11,850	[a]	1,249	16,990	7,645	[a]
1987	2,244	19,786	12,103	[a]	2,222	24,505	9,696	[a]
1988	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1989	651	3,605	[a]	[a]	1,277	8,044	2,922	[a]
1990	626	27,689	[a]	[a]	[a]	[a]	[a]	[a]
1991	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1992	[a]	10,397	[a]	[a]	[a]	[a]	[a]	[a]
1993	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1994	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1995	3,314	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1996	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
1997	3,611	12,610	[a]	[a]	1,447	19,843	[a]	[a]
1998	578	3,497	2,743	[a]	731	11,632	3,619	[a]
1999	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2000	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2001	3,561	29,340	7,330	[a]	2,799	12,383	6,945	[a]
2002	1,470	[a]	3,075	[a]	1,195	[a]	1,208	[a]
2003	3,935	50,140	[a]	[a]	2,131	29,150	[a]	[a]
2004	7,462	31,695	[a]	[a]	2,617	33,670	[a]	[a]
2005	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2006	4,159	78,100	[a]	[a]	[a]	[a]	[a]	[a]
2007	[a]	[a]	[a]	[a]	[a]	[a]	[a]	[a]
2008	2,371	32,500			1,940	13,935		
SEG	640–3,300	5,500–19,500	[b]	[b]	[b]	[b]	[b]	[b]
10-Year Average [c]	2,937	27,453	8,558		1,772	18,159	5,678	

[a] Survey was either not flown or not rated as acceptable.

[b] Aerial survey SEG was discontinued in 2004.

[c] Most Recent 10 year average from years with acceptable data..

APPENDIX D. GOODNEWS TOTAL RUN AND EXPLOITATION

Appendix D1.–Historical Chinook salmon total run estimates and exploitation rates, Goodnews River drainage, 1981–2008.

	Escapement			Harvest				
Year	Middle Fork	Exp. Factor	North Fork [a]	Commercial	Subsistence	Sport	Total Run	Annual Exploitation
1981	3,688	1.3176	4,859 [b]	7,190	1,409		17,146	0.50
1982	1,395	1.2872	1,796	9,476	1,236		13,903	0.77
1983	6,027	1.0400	6,268	14,117	1,066	31	27,509	0.55
1984	3,260	1.6813	5,481	8,612	629		17,982	0.51
1985	2,831	1.7244	4,882	5,793	426	323	14,255	0.46
1986	2,080	0.8551	1,779	2,723	555		7,137	0.46
1987	2,272	1.0099	2,294	3,357	816		8,739	0.48
1988	2,712	1.2621	3,423	4,964	310		11,409	0.46
1989	1,915	0.5098	976	2,966	468	68	6,393	0.55
1990	3,636	1.1561	4,204	3,303	539		11,682	0.33
1991	1,952	1.1561	2,257	912	917	26	6,063	0.31
1992	1,905	1.1561	2,202	3,528	374	23	8,033	0.49
1993	2,349	1.1561	2,716	2,117	708	81	7,970	0.36
1994	3,856	1.1561	4,458	2,570	784	163	11,831	0.30
1995	4,836	1.1561	5,591	2,922	883	41	14,272	0.27
1996	2,931	1.1561	3,389	1,375	415	157	8,266	0.24
1997	2,937	2.4955	7,329	2,039	449	86	12,840	0.20
1998	4,584	0.7907	3,625	3,675	718	431	13,032	0.37
1999	3,221	1.1322	3,647	1,888	871	223	9,850	0.30
2000	2,500	1.1322	2,831	4,442	703	243	10,719	0.50
2001	5,351	1.2722	6,808	1,519	895	147	14,720	0.17
2002	3,085	1.2301	3,795	979	857	224	8,939	0.23
2003	2,389	1.8466	4,411	1,412	737	10	8,959	0.24
2004	4,388	2.8514	12,512	2,565	954	100	20,520	0.18
2005	4,633	1.5982	7,405	2,035	868	0	14,941	0.19
2006	4,559	2.5672	11,704 [c]	2,892	676	79	19,910	0.18
2007	3,852		6,650	3,112	24	177	13,814	0.24
2008	2,162	1.2222	2,642	1,281	730 [d]	163 [d]	6,979	0.31
							Average	0.36
							20-year average	0.31
							15-year average	0.27
							10-year average	0.26
							5-year average	0.21

[a] North Fork estimate calculated using aerial survey proportions from concurrent years or most recent 5 year averages when aerial surveys were not flown or were incomplete.

[b] North Fork estimate calculated using 5 year average from aerial survey proportions from 1982–1986.

[c] North Fork estimate calculated using partial aerial survey proportions from 2006.

[d] 10 year average (1998–2007).

Appendix D2.–Historical sockeye salmon total run estimates and exploitation rates, Goodnews River drainage, 1981–2008.

	Escapement			Harvest				
Year	Middle Fork	Exp. Factor	North Fork [a]	Commercial	Subsistence	Sport	Total Run	Annual Exploitation
1981	49,108	0.8089	39,724 [b]	40,273			129,105	0.31
1982	56,255	0.8089	45,506 [b]	38,877			140,638	0.28
1983	25,816	1.6356	42,224	11,716		14	79,770	0.15
1984	32,053	0.7164	22,964	15,474			70,491	0.22
1985	24,131	0.3578	8,634	6,698	704	75	40,242	0.19
1986	51,069	0.5274	26,932	25,112	943	122	104,178	0.25
1987	28,871	0.8074	23,311	27,758	955	266	81,161	0.36
1988	15,799	0.8089	12,780	36,368	1,065		66,012	0.57
1989	21,186	0.4482	9,495	19,299	861	146	50,986	0.40
1990	31,679	0.5714	18,103	35,823	1,123		86,728	0.43
1991	47,397	0.5714	27,085	39,838	1,282	63	115,665	0.36
1992	27,268	0.5714	15,582	39,194	826	8	82,878	0.48
1993	26,452	0.5714	15,116	59,293	836	53	101,749	0.59
1994	50,801	0.5714	29,030	69,490	770	70	150,161	0.47
1995	39,009	0.5714	22,291	37,351	253	34	98,938	0.38
1996	58,290	0.5714	33,309	30,717	418	87	122,822	0.25
1997	35,530	0.6355	22,579	31,451	609	61	90,230	0.36
1998	49,513	0.3006	14,885	27,161	508	502	92,570	0.30
1999	48,205	0.5438	26,214	22,910	872	561	98,762	0.25
2000	32,341	0.5438	17,587	37,252	1,205	82	88,467	0.44
2001	21,024	2.3694	49,814	25,654	974	108	97,574	0.27
2002	22,101	0.9122	20,161	6,304	1,050	149	49,765	0.15
2003	44,387	1.7201	76,349	29,423	783	42	150,984	0.20
2004	55,926	0.9413	52,646	20,922	960	0	130,454	0.17
2005	113,809	1.1934	135,820	23,933	1,233	0	274,795	0.09
2006	126,772	1.1934	151,290	29,857	1,006	98	309,024	0.10
2007	72,282		63,782	43,716	20	84	179,884	0.24
2008	50,459	2.3323	117,686	27,236	800 [c]	45 [c]	196,226	0.14
							Average	0.30
							20-year average	0.32
							15-year average	0.28
							10-year average	0.22
							5-year average	0.16

[a] North Fork estimate calculated using aerial survey proportions from concurrent years or most recent 5 year averages when aerial surveys were not flown or were incomplete.

[b] North Fork estimate calculated using 5 year average from aerial survey proportions from 1982–1986.

[c] 10-year average (1998–2007).